

**"SELECTRIC" TYPEWRITERS
SERVICE MANUAL CONTENTS
(Alphabetical)**

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INTRODUCTION

The IBM "Selectric" Typewriter is available with film or fabric ribbon and features a small sphere-shaped typing element that eliminates type clashing. The typing element is easily removed to permit changing the typestyle to best suit the application. An impression control permits the operator to vary the impression of the typing element. An automatic velocity control changes the impression of the characters located in certain keyboard positions to a lighter impression regardless of the position of the impression control. A stroke storage mechanism reduces typing errors by storing the second of two rapidly typed characters until the first is printed out. The paper mechanism remains stationary and the element moves across the paper. The underscore, backspace, spacebar, index key and carrier return are typamatic keys.

The applications of the "Selectric" Typewriter include all types of general correspondence, preparation of master copy for most types of duplicating, carbon copies, stencil writing and formwriting. The machine is also available with minor changes in the element, keyboard and cardholder for Optical Character Recognition applications.

The IBM "Selectric" II Typewriter adds a new dimension of versatility to the IBM "Selectric" Typewriter product line. In addition to its regular "Selectric" Typewriter features of single element printing and nonmoving carriage, the IBM "Selectric" II Typewriter is available in either single pitch or dual pitch escapement. It has a new appearance and also includes such other major new features as: (1) selective ribbon system, (2) express backspace and (3) half backspace (dual pitch models only).

1. *Dual Pitch* — Allows the operator to select the typestyle and spacing best suited to the application — whether it is correspondence, manifolding, OCR speech writing, legal, file indexes, or other.
2. *Selective Ribbon System* — Allows the use of film ribbon or the new IBM Tech III ribbon, both contained in cartridges for easier and fewer changes. The IBM Tech III ribbon creates a high quality, more uniform image on a wider range of surfaces with an extremely high character yield.
3. *Express Backspace* — Moves the carrier to the left quickly, under complete control of the operator, while remaining on the same writing line.
4. *Half Backspace (Dual Pitch Only)* — Permits typing half-way between two characters or spaces allowing the operator to "squeeze-in" a character.

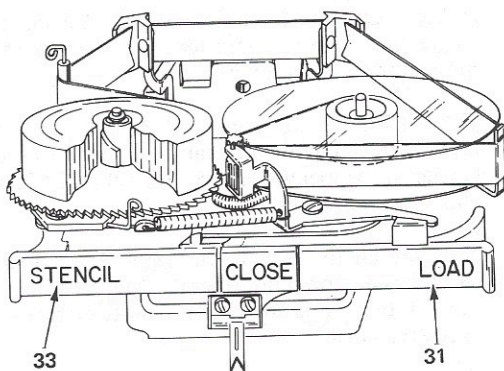
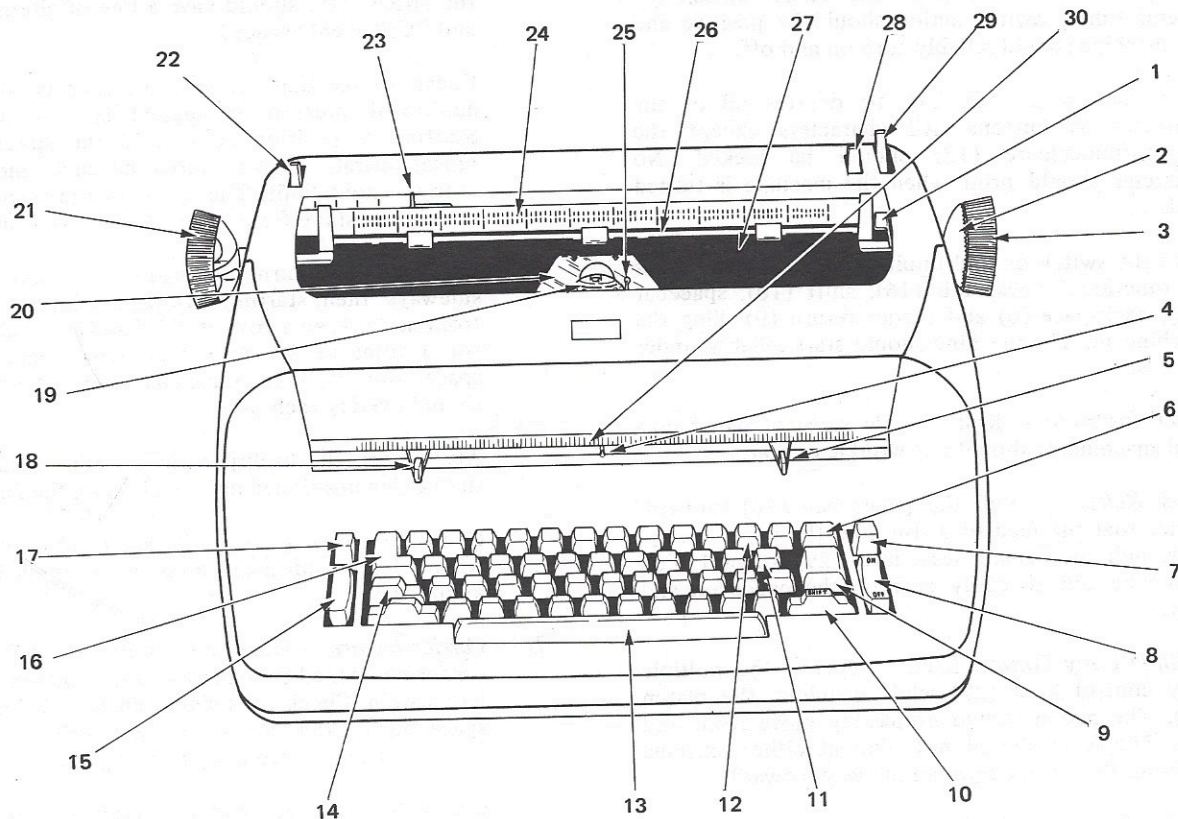
The IBM Correcting "Selectric" Typewriter provides the operator with an efficient means of correcting original copy without having to lift the hands from the keyboard.

A "correcting" keybutton has been placed on the right side of the keyboard. If an error is made, the typist simply depresses the "correcting" keybutton, restrikes the incorrect character and resumes typing. All actions necessary to position the carrier over the incorrect character, place the correcting tape in position and maintain the proper carrier position following the correction are accomplished by one stroke of the "correcting" keybutton.

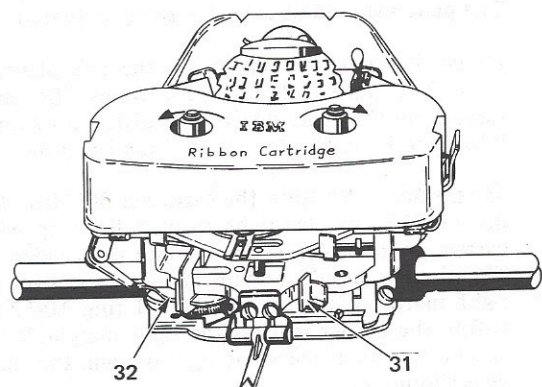
The correcting mechanism allows the operator a choice of two types of correcting supplies. Both types employ a correcting type mounted on the carrier, adjacent to the ribbon. If the typist chooses to use the "lift-off" correcting tape, a unique IBM Correctable Film Ribbon must be used. If the IBM Tech III "cover-up" correcting tape is used, an IBM Tech III ribbon should be used. Both types of correcting tapes are color coded for identification and can be easily installed by the operator.

FUNCTIONAL CHECK - IBM "SELECTRIC" TYPEWRITER

This functional check is a procedure that will tell you whether or not an IBM "Selectric" Typewriter has any malfunctions. It includes checks of every function of the machine, organized in an efficient sequence.



Film Ribbon



Fabric Ribbon

- | | | |
|---|---------------------------------|------------------------------|
| 1. Detent Release Lever | 12. Hyphen/Underscore Key | 23. Paper Guide |
| 2. Page End Indicator | 13. Spacebar | 24. Copy Guide Scale |
| 3. Platen Knob | 14. Shift Lock | 25. Impression Control Lever |
| 4. Position Indicator (Carrier Pointer) | 15. Tab Set & Clear | 26. Paper Bail |
| 5. Right Margin Stop | 16. Tab Key | 27. Platen |
| 6. Backspace Key | 17. Margin Release Lever | 28. Line Space Lever |
| 7. Index Key | 18. Left Margin Stop | 29. Paper Release Lever |
| 8. On/Off Switch | 19. Typing Element (Typehead) | 30. Front Scale |
| 9. Carrier Return Key | 20. Clear View Cardholder | 31. Ribbon Load Lever |
| 10. Shift Key | 21. Platen Variable | 32. Ribbon Lift Lever |
| 11. Multiple Character Key | 22. Multiple Copy Control Lever | 33. Stencil Control |

PRINT QUALITY

1. *Strikeup* – Set the impression control lever (25) at three. Make a strikeup of all the characters on the keyboard in the following manner: type one character, then an “H,” another character and an “H,” etc., until you have typed every character in upper and lower case. Make this strikeup several times. First, use a very slow and deliberate touch, then a heavy, rapid touch. Remember, every operator has a slightly different touch. You should meet the following conditions, regardless of how you vary the touch.
 - A. All keys should have printed the correct character.
 - B. All characters should have even color.
 - C. No characters should be obviously out of position.
 - D. There should be even spacing between characters with no overlap.
 - E. All keybuttons should move down easily and the correct character should print before the keybutton bottoms.
2. *Repeat Characters* – Lightly depress the hyphen/underscore keybutton. The characters should print once for a single depression. The character should repeat when more pressure is applied. You should not be able to stall the repeat operation by pushing down hard on the keybutton.
3. *Impression Control* – Type a letter character with the impression control lever at one and at five. You should hear a noticeable difference in the sound of the typehead (19) hitting the paper. Return the impression control lever to three.
4. *Line Spacing* – Type several lines of underscores in both line space lever (28) positions. The space between the typed lines should be even for both line space lever positions.
5. *Scales* – Type a line of upper case “V’s.” The horizontal line on the cardholder (20) should be parallel to the line of “V’s.”

The points of the “V’s” should line up with the vertical lines on the cardholder.

Set the left margin as far to the left as it will go. Operate the carrier return. The pointer should line up with zero on the front scale (30).
6. *Type alternate upper and lower case “Z’s.” The characters should print properly with even spacing.*

Slowly depress the shift lock (14). The button should lock down just as or slightly after a shift occurs.

Lock the shift in upper case and type a full line of underscores. The lock should not release by vibration.

The shift should unlock when either shift button is lightly depressed.

7. *Film Ribbon Operation* – Look at the ribbon and the typed samples. The pattern on the ribbon should look similar to this.



There should be neither character overlap on the ribbon nor voids (white spaces) on the printed characters. Depress the stencil control (33) and type a few underscores. The ribbon should not feed and the underscore should miss the ribbon. Return the stencil control to its normal position.

8. *Fabric Ribbon Operation* – Type a series of underscores with the impression control lever set on five and the ribbon lift lever (32) in the high lift position. Look at the position the underscore printed on the ribbon. It should be near the bottom and all underscores should print on the ribbon. If a black and red ribbon is used, all characters must print black when the ribbon lift lever is in the low lift position. All characters must print red when the lift lever is in the high lift position. When the lift lever is in the stencil position, the underscore must not print on the top of the ribbon.

Remove the ribbon cartridge. Depress the repeat underscore and note which ribbon feed ratchet is rotating. Turn the other feed ratchet in the same direction while depressing the repeat underscore. The ribbon mechanism must reverse and drive the opposite spool. Repeat the procedure for the other spool.

Reset the margins and tab stops as they were when you started. This concludes the detailed function check.

OPERATOR CONTROLS

1. *Switch Pitch Lever* — The switch pitch lever changes the pitch of the machine between the 10 pitch mode and the 12 pitch mode.
2. *Half Backspace Lever* — The half backspace lever moves the carrier one half backspace to the left when the lever is held forward.
3. *Express Backspace Keybutton* — The express backspace keybutton moves the carrier rapidly to the left as long as the keybutton is held depressed.
4. *Detent Release Lever* — This control performs the same function as on the "Selectric" Typewriter; just its location is changed.
5. *Stencil Lever* — The stencil lever slides right-to-left and determines whether the ribbon mechanism is in the ribbon or stencil mode.
6. *Ribbon Load Lever* — The ribbon load lever raises the ribbon lift guides and prepares the ribbon mechanism to permit changing the ribbon.

SWITCH PITCH/HALF BACKSPACE

1. Place your switch pitch lever in the 10 pitch mode (to the rear). With the margin set at zero, carrier return and make a strikeup of letter "l's" about two inches long.
2. Pull the switch pitch lever forward to the 12 pitch mode. Carrier return and make another strikeup below the previous one. The machine changed pitch if the second row of characters does not align with the first row.
3. Return the machine to its 10 pitch mode and type a series of slashes (/). Backspace to the beginning of the slashes; then pull the half backspace lever forward.
4. While holding the lever forward, type another series of slashes. The characters must be centered between the characters previously typed.

DUAL PITCH TAB/ESCAPEMENT

1. Install a sheet of paper. Clear all tab stops and reset tabs at several locations along the writing line. Operate the tab from the margin and type a character at each stop. Repeat this procedure for three lines. The characters should line up in straight vertical columns.

Clear the tab stops and change pitch. Make the same check again after changing pitches.
2. Now, tab all the way to the right. Hold down the tab clear keybutton and operate the carrier return. All the set tab stops should clear automatically without excessive noise.
3. With the carrier at the extreme right, depress the carrier return, then depress the tab. The tab operation should immediately override the carrier return.

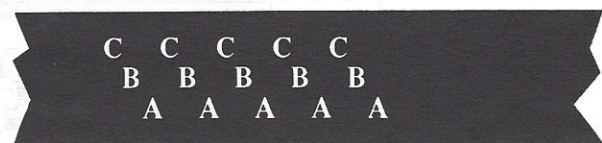
4. With the carrier at the extreme left and all tab stops cleared, depress the tab, then carrier return. The carrier return should immediately override the tab.

ROTARY BACKSPACE/EXPRESS BACKSPACE

1. Turn the paper in your machine sideways; then, starting with the carrier at the left, type a row of "h's" and "n's" alternately for a total of 10 characters. Now, backspace 10 spaces and type over. The characters should overlay each other. Make the check in both pitches.
2. Also check the backspace in a similar manner with the carrier positioned in the middle and toward the right of the writing line.
3. Check to see that the backspace mechanism repeats when slight additional pressure is applied to the keybutton.
4. Depress the express backspace keybutton. The carrier should move to the left as long as the keybutton is held depressed.

SELECTIVE RIBBON SYSTEM

1. Put a single sheet of bond paper in your machine. With the multiple copy control lever forward and the impression control lever on three, make a complete strikeup in upper and lower case.
2. Inspect the copy for character uniformity; that is, even color density throughout.
3. Inspect the copy for ribbon flaking; that is, splattering of ribbon particles on the copy.
4. With a film ribbon installed on your machine, the lift pattern should look like this example:



Inspect the ribbon pattern on your machine. The characters should not overlap one another and the characters should be positioned on the ribbon with a margin of safety at the top and bottom.

With a Tech III ribbon installed on your machine, inspect the ribbon pattern. The characters should overlap one another and there should be a margin of safety at the top and bottom of the ribbon. Type several lines of underscores. The typing must not fade.

5. Inspect the ribbon throughout its path around the various guides and rollers. There should be no creases in the ribbon.
6. Finally, place the stencil control lever in the stencil position and type several characters. The ribbon should not feed or lift.

MOTOR AND DRIVE OPERATIONAL THEORY

The drive mechanism (Figure 1) supplies power to drive the cycle shaft and the operational shaft. The motion to operate the mechanisms within the "Selectric" Typewriter is obtained through the various cams and gears which are driven by these two shafts.

The shaded pole motor utilizes a centrifugal motor clutch to provide drive to a cogged drive belt. The drive belt drives the cycle clutch hub which in turn drives both the operational shaft and the cycle shaft.

The motor is allowed to approach normal operating speed before the clutch engages the drive mechanism. The momentum developed by the motor causes the machine to start even though several mechanisms may have been tripped with the machine "OFF."

CAPACITOR START MOTOR

Early level machines were equipped with a capacitor start motor. The capacitor gives the motor starting direction and torque. Refer to Early Level Drive this section.

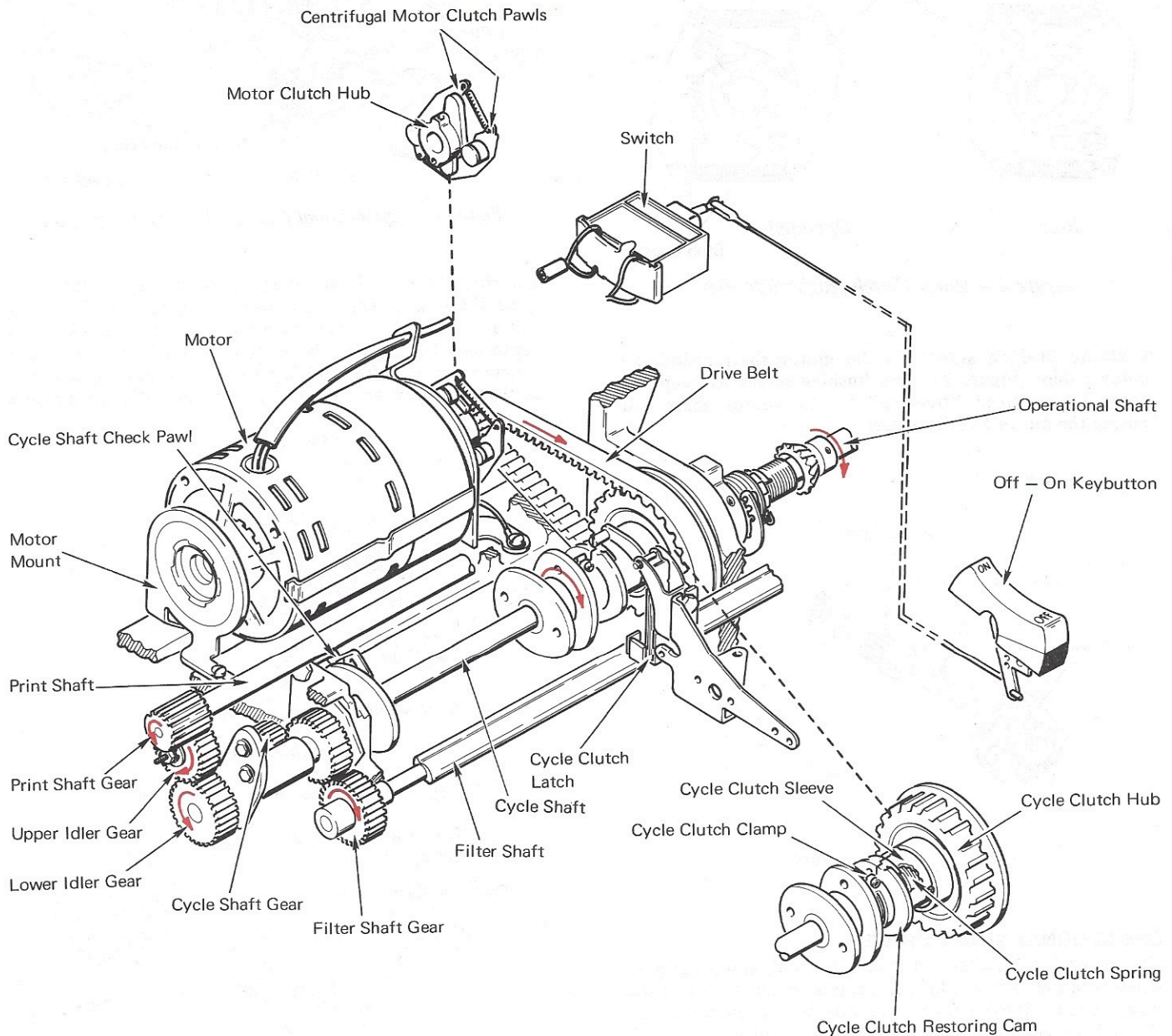


Figure 1 - Drive Mechanism

CYCLE CLUTCH

The control for starting and stopping the cycle shaft is the cycle clutch which uses a "helical spring" type of drive.

If the turned up ear on the right end of the spring (Figure 6) were held stationary, and the left end turned in the direction shown by the arrow, the spring would tend to unwind and the inside diameter would become larger. If the left end of the spring was held in this position and the right end turned loose, the spring would wind up under its own tension and the inside diameter would become smaller.

The driving arbor of the cycle clutch pulley hub is slightly larger than the inside diameter of the spring when the spring is in its relaxed state. With the spring held in its unwound position, its inside diameter is large enough so the driving arbor will fit inside and have clearance. If the right end of the spring were released, the spring would wind up on the driving arbor and be turned further in a winding direction, in turn driving anything attached to the left end of the spring. If the right end of the spring were stopped and the left end continued to turn, the diameter of the spring would increase and would no longer be driven by the driving arbor.

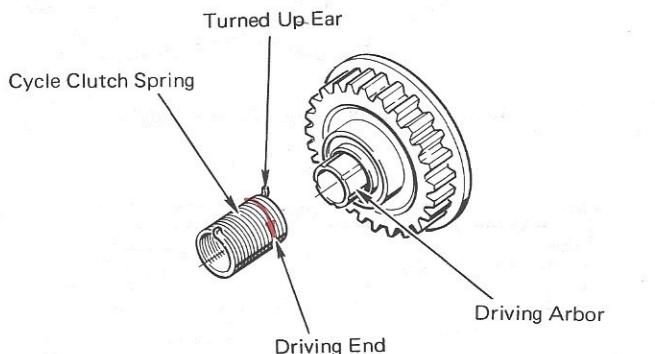


Figure 6 – Cycle Clutch Spring

The right end of the cycle clutch spring fits through a cycle clutch sleeve. The turned up ear fits into a notch on the right side of the cycle clutch sleeve. If the cycle clutch sleeve is stopped, the right end of the spring is stopped. The left end of the cycle clutch spring fits over the cycle shaft and is clamped securely to the cycle shaft by an adjustable clamp (Figure 7).

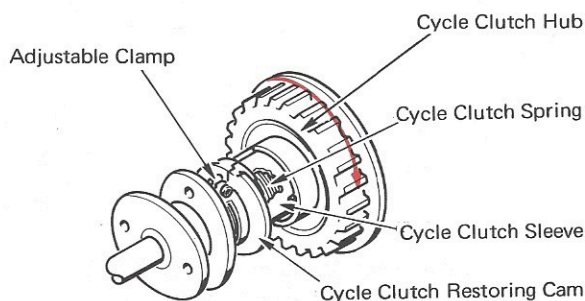


Figure 7 – Cycle Clutch Mechanism

Starting and stopping the cycle shaft is dependent upon controlling the expansion and contraction of the spring. As the shaft and clutch turn, top to front, one of the latch surfaces on the cycle clutch sleeve contacts the cycle clutch latch. This will stop the cycle clutch sleeve and right end of the cycle clutch spring completing 180 deg. of rotation (Figure 8).

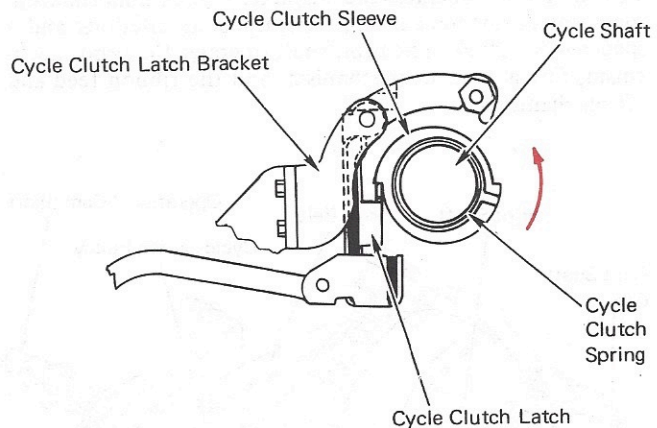


Figure 8 – Cycle Clutch Latch (Right Side View)

The cycle shaft has inertia and tends to keep turning even though the sleeve has stopped. The result is the spring unwinds and is expanded to a point where the hub is no longer driving the spring. A cycle clutch check pawl is mounted at the extreme left end of the cycle shaft on the inside of the left casting. The inertia of the shaft expands the cycle clutch spring and at the same time allows the check pawl to drop into its latch surface. The left end of the spring is now fixed so the cycle shaft cannot turn backwards and allow the spring to engage on the hub. (Fig. 9)

When another cycle is desired, all that is needed is to pull the cycle clutch latch free of the sleeve. This will allow the right end of the cycle clutch spring to wind up, grab the hub and go through another cycle. When the step on the opposite side of the sleeve engages the cycle clutch latch, the right end of the spring will be stopped and the cycle shaft will overthrow and the check pawl will drop in. The cycle shaft is now in a latched position.

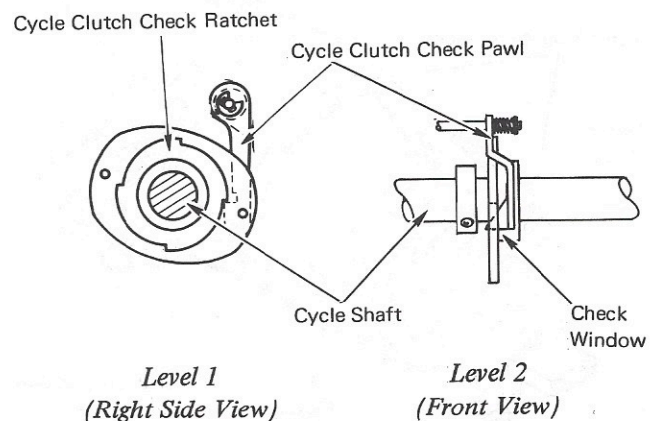


Figure 9 – Cycle Clutch Check Pawl

EARLY LEVEL MOTOR

In the early production machines, a capacitor-start induction type motor is used. A three mfd. capacitor, in the starting winding circuit, provides a starting torque for the motor and controls the direction of rotation. The capacitor also remains in the circuit while the motor is running. The capacitor is mounted in a vertical position by a bracket at the rear corner of the machine. (Figure 13).

In ungrounded systems, the capacitor is isolated from the power frame by a fiber insulator and nylon mounting screws. The motor is insulated from the power frame by its rubber mounting. To convert an ungrounded system to a grounded one, three steps must be taken: (a) The two-wire line cord must be replaced with a three-wire cord and the ground lead must be attached to the power frame at the cord clip; (b) A short jumper wire must be connected from the motor to the power frame; (c) The capacitor must be grounded to the power frame by replacing the nylon mounting screws with metal ones and removing the insulating material from between the capacitor and the frame of the machine.

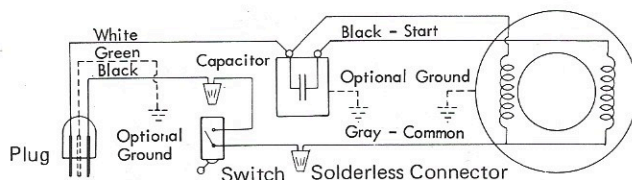
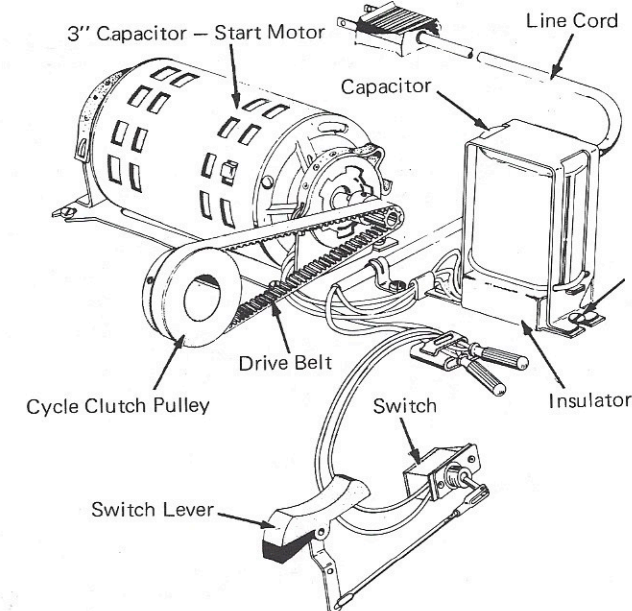
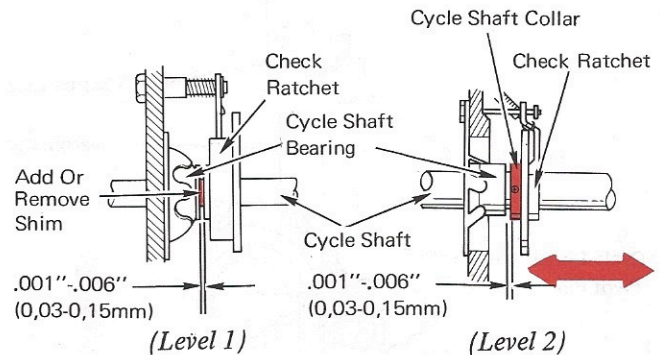


Figure 13 - Early Capacitor - Start Motor

MOTOR AND DRIVE ADJUSTMENTS

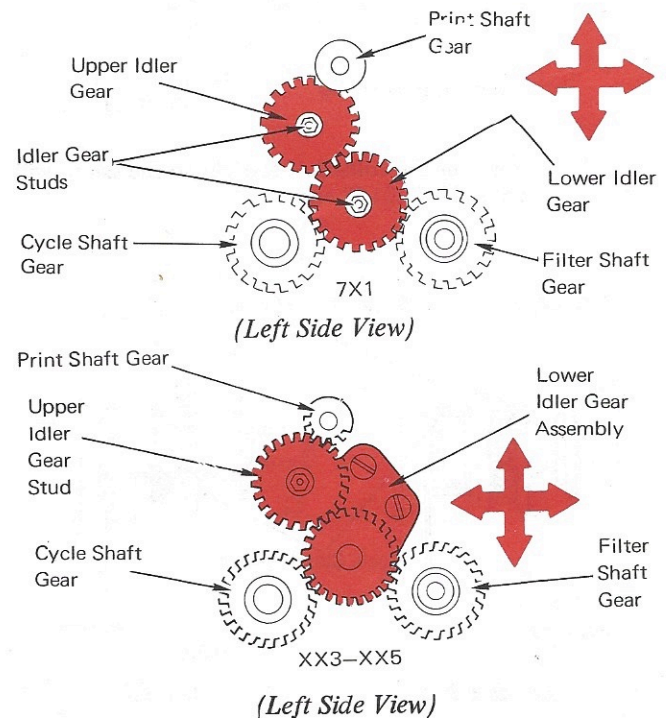
1. *Cycle Shaft End Play* - Adjust the collar on the shaft to obtain .001"-.006" end play of the cycle shaft.

CAUTION: The slight end play of the cycle shaft ensures that it will rotate freely. Excessive play could allow a coil of the cycle clutch spring to wedge between the two hub members of the clutch causing a machine lockup.



2. *Gear Train Backlash* - Adjust the upper and lower idler gears so minimum backlash is present between mating gears. The mechanism must be free of binds throughout 360 degrees rotation of the gears. Minimum backlash is necessary to prevent erratic operation of the drive train and to ensure minimum overthrow of the driven shafts. The lower idler gear must be adjusted first because the upper idler gear is adjusted to the final position of the lower gear.

NOTE: Filter shaft and print. Shaft timing must be checked after making this adjustment.



POWER ON ADJUSTMENT PROCEDURE

The cycle clutch adjustments must be obtained with the power on as outlined in the following procedure.

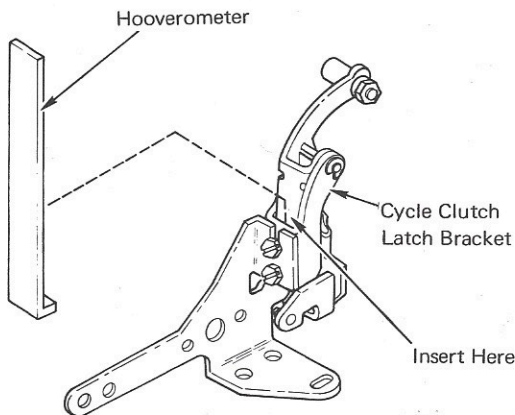
Pre-Conditions:

The cycle shaft, filter shaft, and print shaft must be properly timed.

The gear train backlash must be correct.

The remainder of the machine must be functional.

- Leave the right-hand dust shield in place while performing this "power on" adjustment. This will eliminate the danger of the bristo wrench being thrown out of the machine due to the possibility of it contacting the torque limiter hub. Rotation of the cycle clutch pulley and drive belt does not constitute a hazard as there are no exposed projections which could propel the bristo wrench out of the machine.
- Turn machine on, position the cycle clutch collar screw up, then position the carrier into the RH margin to prevent cycling of the cycle shaft.
- Insert the "L" shaped foot of the Hooverometer into the cycle clutch latch link to prevent accidental cycling of the machine while performing the "power on" adjustment of the cycle clutch.

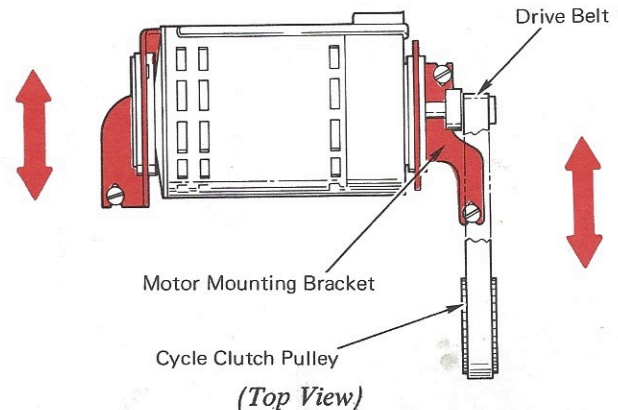


- Loosen the cycle clutch clamp screw and advance print shaft (top-to-rear). **CAUTION:** Do not trip the cycle clutch with the bristo wrench in the clamp screw.
- At this time, check the left-to-right position of the cycle clutch spring. Expand the cycle clutch spring by pushing the LH side of the spring with a spring hook. The lateral position of the spring can be changed by pushing left or right for proper adjustment with the cycle pulley.
- Rotate the print shaft a complete cycle (top-to-rear) until the cycle shaft check pawl drops in. Back the cycle shaft up against the check pawl.
- Position the collar left-to-right so the sleeve will have .010"-.015" end play.

Position the overthrow stop for .007"-.015" clearance and tighten the clamp screw.

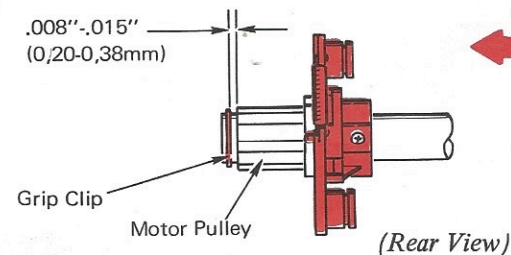
This will give approximately 1/2 tooth of motion to "unwrap" the spring in its rest position. Observe this motion at the print shaft gear by hand cycling a zero tilt, negative five character with the power off.

- Drive Belt** — Adjust the motor mounting brackets front-to-rear to obtain a minimum amount of belt noise. The belt must not be loose enough to allow the belt to jump cogs on the motor pulley. Check by operating the carrier return mechanism and holding the carrier while simultaneously operating the shift mechanism. This loads the motor to a point where failure will be most probable.

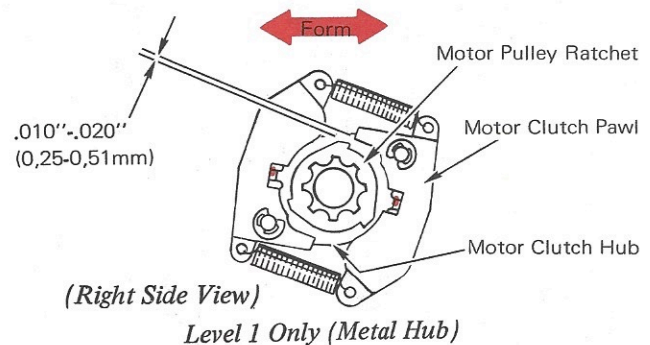


- Motor Pulley** — Adjust hub assembly and grip clip left-to-right so the belt rides fully on both pulleys. Maintain .008"-.015" pulley end play with grip clip.

NOTE: Make certain the plastic bushing is installed to prevent the motor pulley from "freezing" to the shaft.



- Motor Clutch Pawl Stops** — Form the lug on the clutch hub to obtain a clearance of .010"-.020" between the tip of a clutch pawl and the pulley ratchet when the pulley is manually rotated.



KEYBOARD OPERATIONAL THEORY

The keyboard is a compact, detachable unit which controls the selection of the specific character that will print. This is accomplished through the use of keylevers, interposers and bails, which provide character selection and cycle clutch release (Figure 1).

A keyboard lock mechanism, controlled by the on/off switch lever, is contained in the keyboard and will be described in this section.

All functional keylevers are described in their specific sections of this manual.

The keylevers pivot on a fulcrum rod at the rear. A guide comb stabilizes and limits the vertical travel of the

keylevers at the front. Keylever tension is supplied by flat leaf springs under the front of the keylevers. The forward end of each spring is cupped so that the spring will maintain its position under the keylever. Different spring tension is supplied to the four rows of character keylevers by auxiliary leaf springs under the keylever springs. The auxiliary leaf springs vary in length to offset the leverage difference between the four rows of keylevers. This variation in spring tension permits a uniform operating force for all keylevers.

Attached to each keylever by a shoulder rivet is a keylever pawl. This pawl is spring loaded and is in a position to strike the top of an interposer.

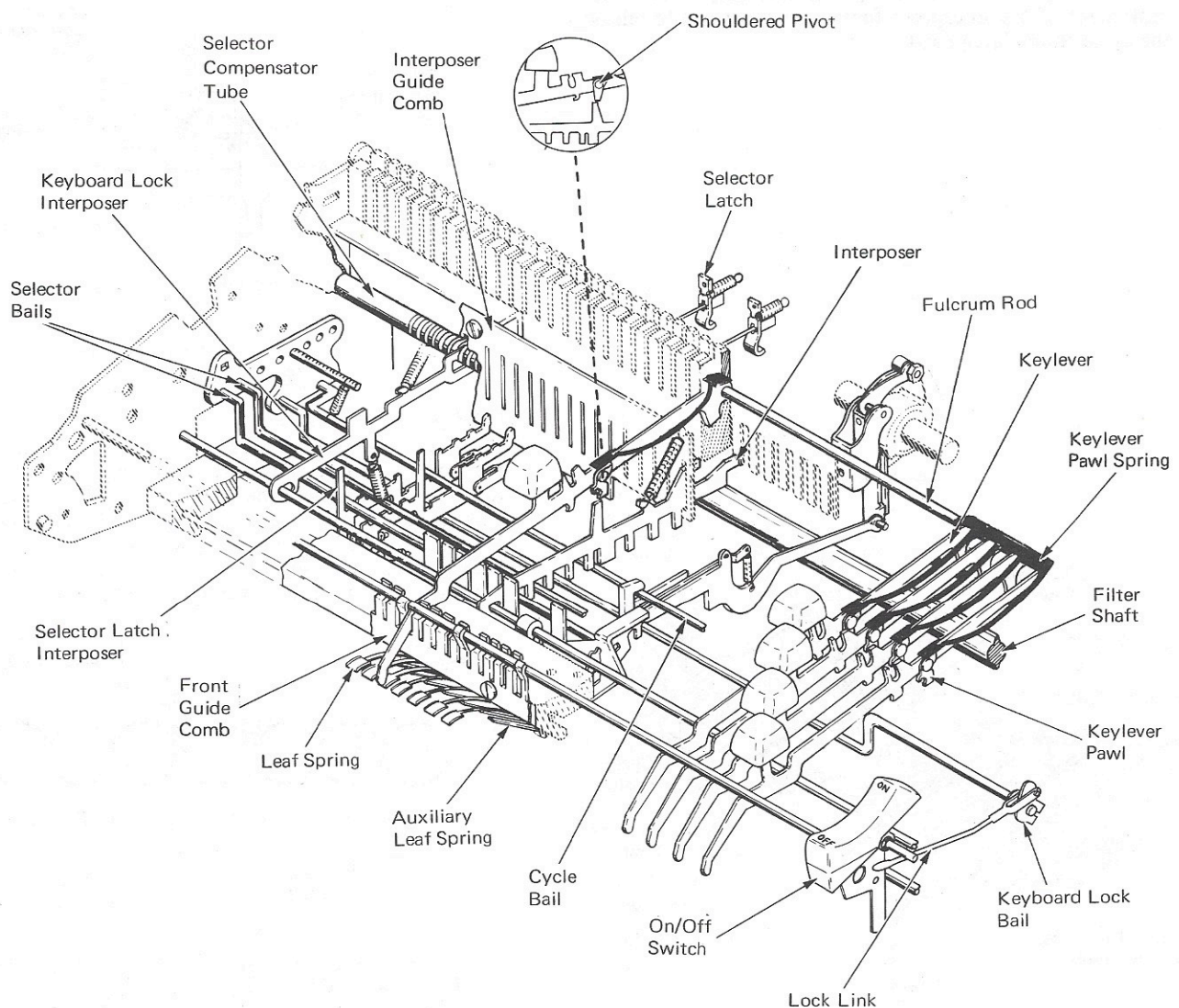


Figure 1 – Keyboard Mechanism

An adjustable end plug, located at each end of the compensator tube, keeps the steel balls centered between the interposers. The balls are thus prevented from shifting too far to the left or right. If the balls were allowed to move too far under the interposer lugs, they would partially block the depression of an interposer and result in a stiff keyboard (Figure 5).

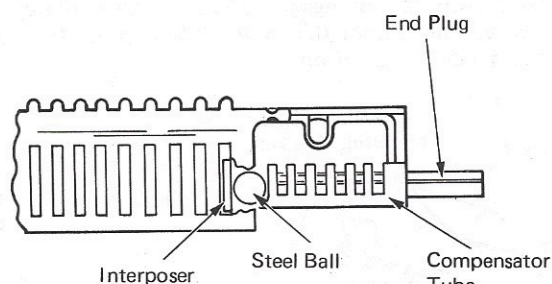
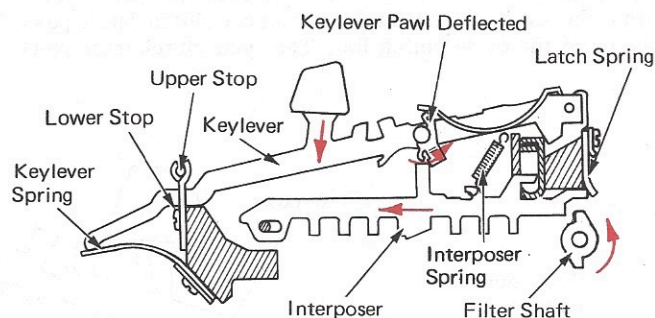


Figure 5 - Compensator Tube

A filter shaft is mounted just to the rear of the interposers (Figure 7). Once the interposer is in the latched position, rotation of the filter shaft will drive the latched interposer forward. The interposer lugs will then operate its corresponding selector bail. The interposer motion is sufficient to remove the interposer from beneath the interposer latch spring. This allows the interposer spring to restore the interposer to its rest position.



(Right Side View)

Figure 7 - Interposer Operation

SELECTOR LATCH INTERPOSER

Located at the left end of the selector bails are six latch interposers. Each latch interposer has a lug that extends up directly in front of the selector bail. As the selector bail is driven forward, the latch interposer is carried with it (Figure 6).

An adjustable link connects each latch interposer to one of the selector latches of the selection mechanism. When a latch interposer is moved forward, the selector latch connected to that interposer is also pulled forward to prevent it from being operated downward by the latch bail.

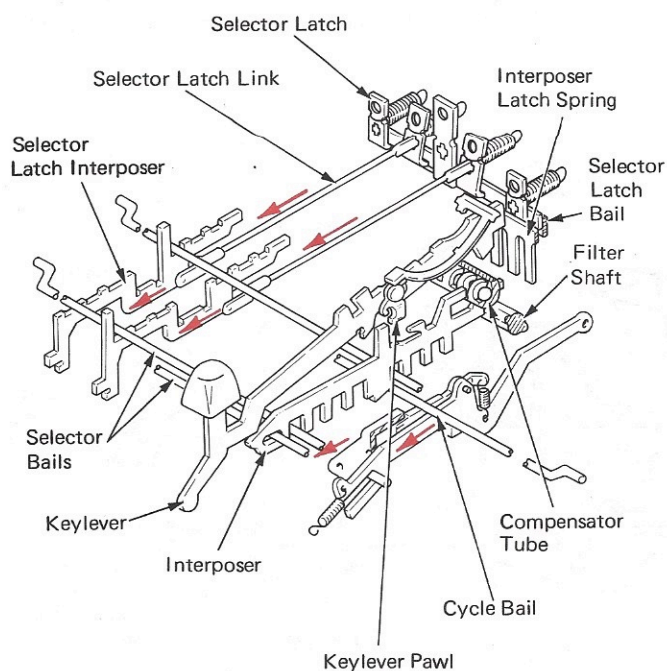


Figure 6 - Keyboard Selection Mechanism

CYCLE BAIL DAMPERS (LEVEL 1 ONLY)

A small lever, called the cycle bail damper, pivots at each side of the keyboard just above the cycle bail (Figure 10). The purpose of the dampers is to lightly retard the upward movement of the cycle bail to prevent the bail from bouncing as it reaches the upward limit. Without the dampers, the bail would have a tendency to bounce and cause an extra cycle of the cycle clutch.

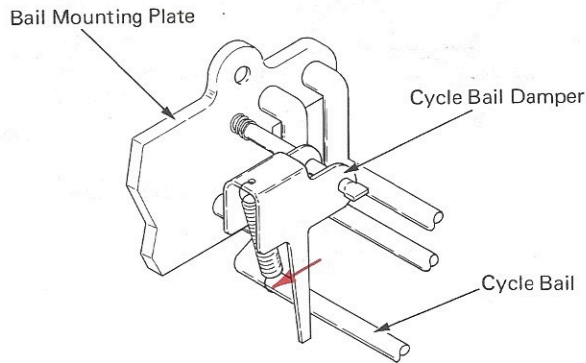


Figure 10 – Cycle Bail Damper (Level 1)

KEYBOARD LOCK

When the switch is in the off position, the keyboard must be locked to prevent an unwanted print operation the next time the switch is turned on.

The switch lever operates the lockout bail into a position below an extension of the cycle clutch latch pawl when the switch lever is in the off position. To further assure against an interposer from latching down, a linelock interposer at the left side of the keyboard is rotated into the selector compensator tube by the lockout bail. This forces the steel balls to shift in the tube and block the downward movement of all interposers. When the switch is in the on position, the linelock interposer is spring loaded out of the selector compensator tube (Figure 11).

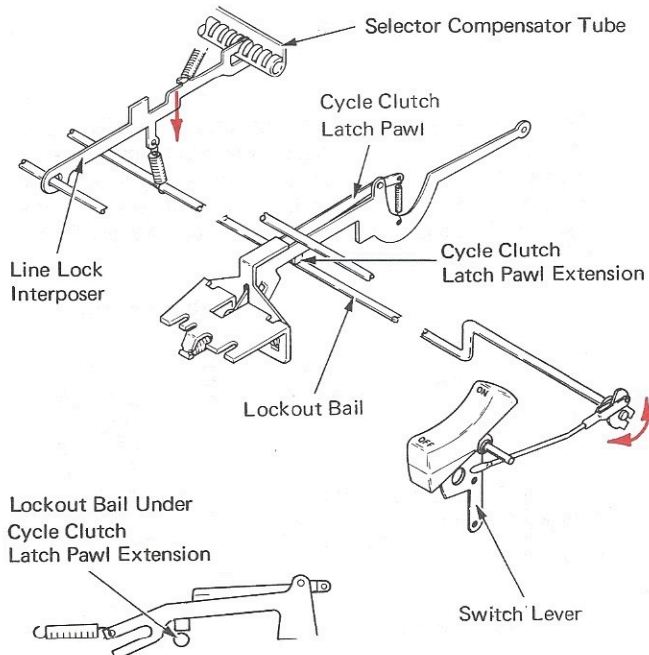


Figure 11 – Keyboard Lock Mechanism – Off Position (Right Side View)

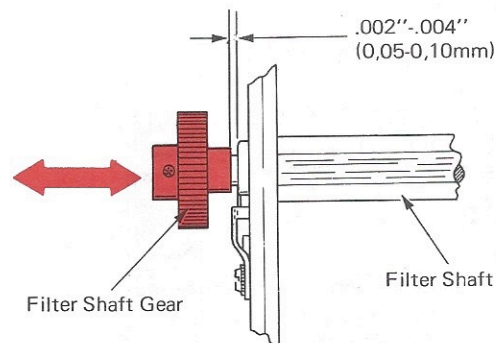
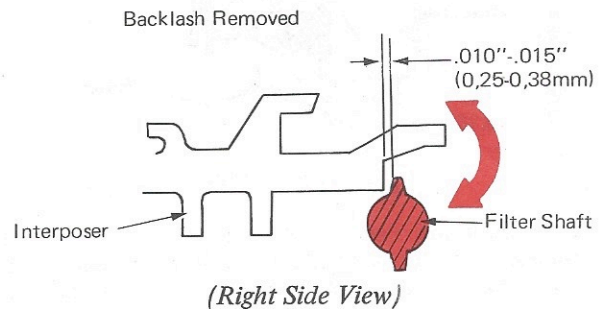
KEYBOARD ADJUSTMENTS

1. **Filter Shaft** – With the machine at rest and all gear train backlash removed in the forward direction, the working surface of the filter shaft should clear the rear of any latched interposer by .010"-.015" (0,25-0,38mm). Loosen the filter shaft gear and adjust the filter shaft rotationally to meet this condition. Be sure to maintain .002"-.004" end play of the filter shaft within the left-hand filter shaft bearing.

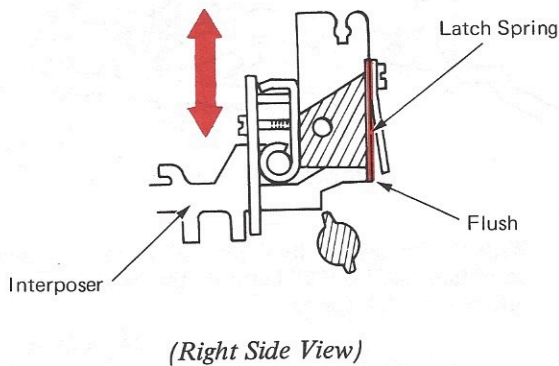
This adjustment affects the timing of all the cams mounted on the filter shaft.

Insufficient clearance between the filter shaft and the interposers could allow the filter shaft to stop just under the rear of the interposers. The keyboard would then be inoperative, because the interposers could not be depressed.

Excessive clearance would delay the operation of the interposers. The selector latches would not be pulled forward until after having been pulled down slightly by the latch bail. This would result in excessive wear and a noisy operation as the latches were snapped forward under the bail. This condition is referred to as "popping latches."



6. **Interposer Latch Springs** – Adjust the left and right bank of interposer latch springs so the end of the latch springs are flush with the bottom of the interposer.

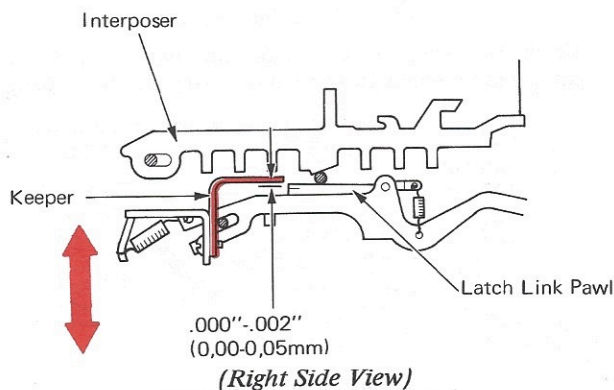


7. **Cycle Clutch Keeper** – With any interposer latched down, adjust the keeper vertically to obtain .000"-.002" clearance between the cycle clutch latch link pawl and the lower side of the keeper. Then, check the clearance with various interposers latched down.

The interposer latch spring adjustment may need to be refined to maintain .000"-.002" clearance across the keyboard.

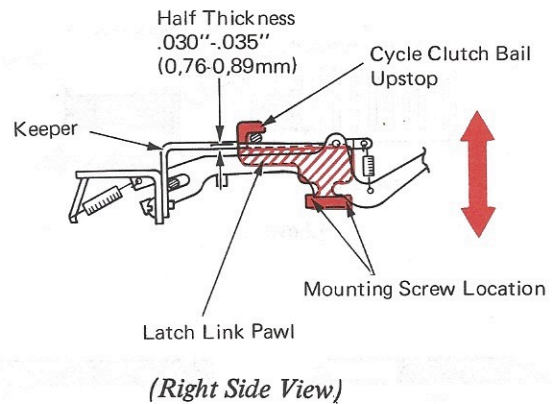
NOTE: This clearance should be maintained on the low side of the adjustments. Too much clearance can cause an erroneous selection because of flicking action on the keylevers, causing the cycle clutch to be released without latching an interposer down. As a result, the filter shaft will not drive an interposer forward and an undesired character will be printed.

Insufficient clearance does not ensure that the clutch will be released when an interposer is latched down. If an interposer is latched down without releasing the cycle clutch, the keyboard will be locked because the interposer will remain in the compensator tube.

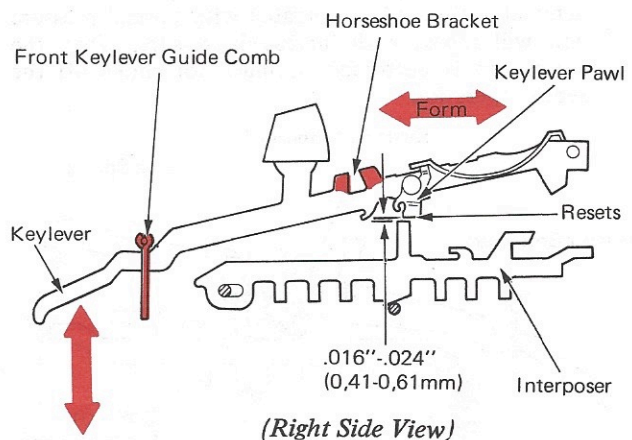


8. **Cycle Bail Upstop** – Adjust the cycle clutch bail upstop vertically so the cycle clutch latch link pawl engages the cycle clutch keeper by half its thickness with the machine at rest. This can be gauged by making the center of the scribe line on the latch link pawl even with the bottom of the keeper. The bail stop is mounted with two nuts and two screws. These nuts and screws also control the position of the character interrupter bail plate. In order to adjust the cycle clutch bail stop, loosen both nuts and only the front screw. Do not loosen the rear screw.

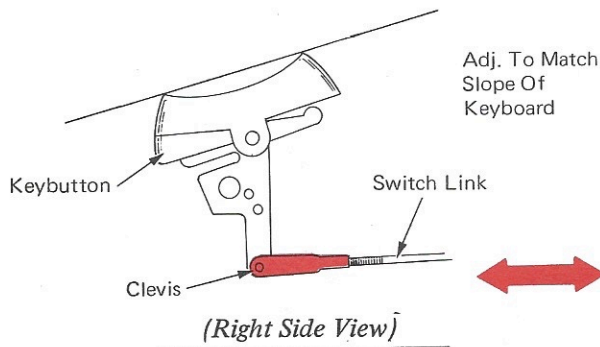
Insufficient bite will increase the possibility of a repeat cycle because positive latching is not ensured. Excessive bite will affect the touch of the keyboard because the latch pawl must be moved further in order to trip the cycle clutch.



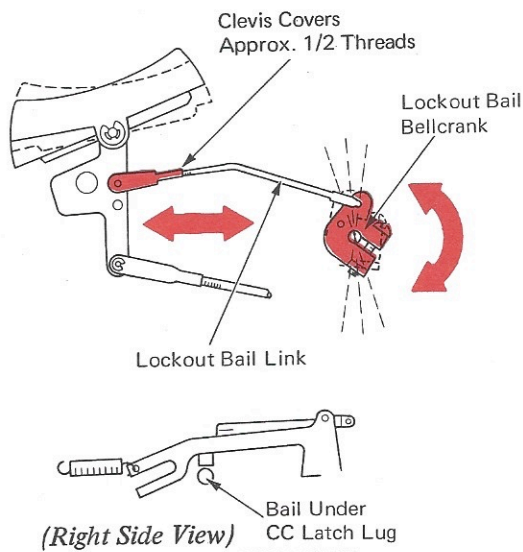
9. **Front Keylever Guide Comb** – With the power on, depress and slowly release keybuttons on the right, left and middle of the keyboard. There should be .016"-.024" clearance between the keylever pawl and the interposer lug as the keylever pawl resets above the interposer. Adjust the front keylever guide comb vertically to satisfy this condition. Individual keylevers that do not conform to the majority may be formed at the horseshoe bracket.



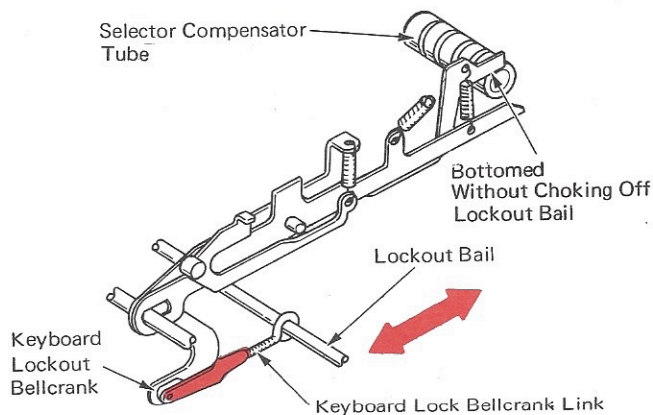
12. *Switch Link* – Adjust the switch link clevis so the on/off keybutton matches the slope of the keyboard in the off position.



13. *Lockout Bail Link And Bellcrank* – With the switch in the off position, adjust the clevis to cover approximately one-half the threads on the link. Loosen the screw on the lockout bail bellcrank and position the lockout bail under the cycle clutch latch lug. Tighten the screw.



14. *Keyboard Lock Bellcrank Link* – Machines equipped with this link should be adjusted so the bellcrank is fully bottomed in the selector compensator tube without choking off the action of the lockout bail.



SHIFT OPERATIONAL THEORY

The purpose of the shift mechanism is to rotate the typehead 180 degrees in the counterclockwise direction. This action places the upper case hemisphere of the typehead near the platen for typing capital letters. Each upper case character is in the same tilt and rotate band as the lower case counterpart, but 180 degrees from it.

The shift mechanism consists of a shift arm, shift cam, spring clutch, clutch control mechanism and interlocks.

Two keybuttons, one at each front corner of the keyboard, can be used to actuate the shift mechanism. A bail is used to tie the two keylevers together. The left-hand keylever has a lock mechanism attached to it to enable the operator to lock the keybutton down in the upper case position. The shift lock may be released by depressing and releasing either shift keybutton.

The power to operate the shift mechanism is taken from the right-hand end of the operational shaft (Figure 1).

Motion of the shift bail is transferred through the shift release bellcrank and shift release link to operate the release arm. The release arm controls the shift ratchet and clutch spring to allow the shift cam to rotate.

Depression of the shift keybutton causes the shift cam to rotate, forcing the shift arm to move away from the power frame. This delivers sufficient pull on the rotate tape to rotate the typehead 180 deg. to the upper case position.

Releasing the shift keybutton allows the shift keylevers to be returned to their rest position by the shift keylever spring and causes the shift cam to return home. The shift arm moves toward the power frame and the spring tension on the rotate tape system returns the typehead to the lower case position.

NOTE: The rotate tape and pulley system is covered under the character selection section of this manual.

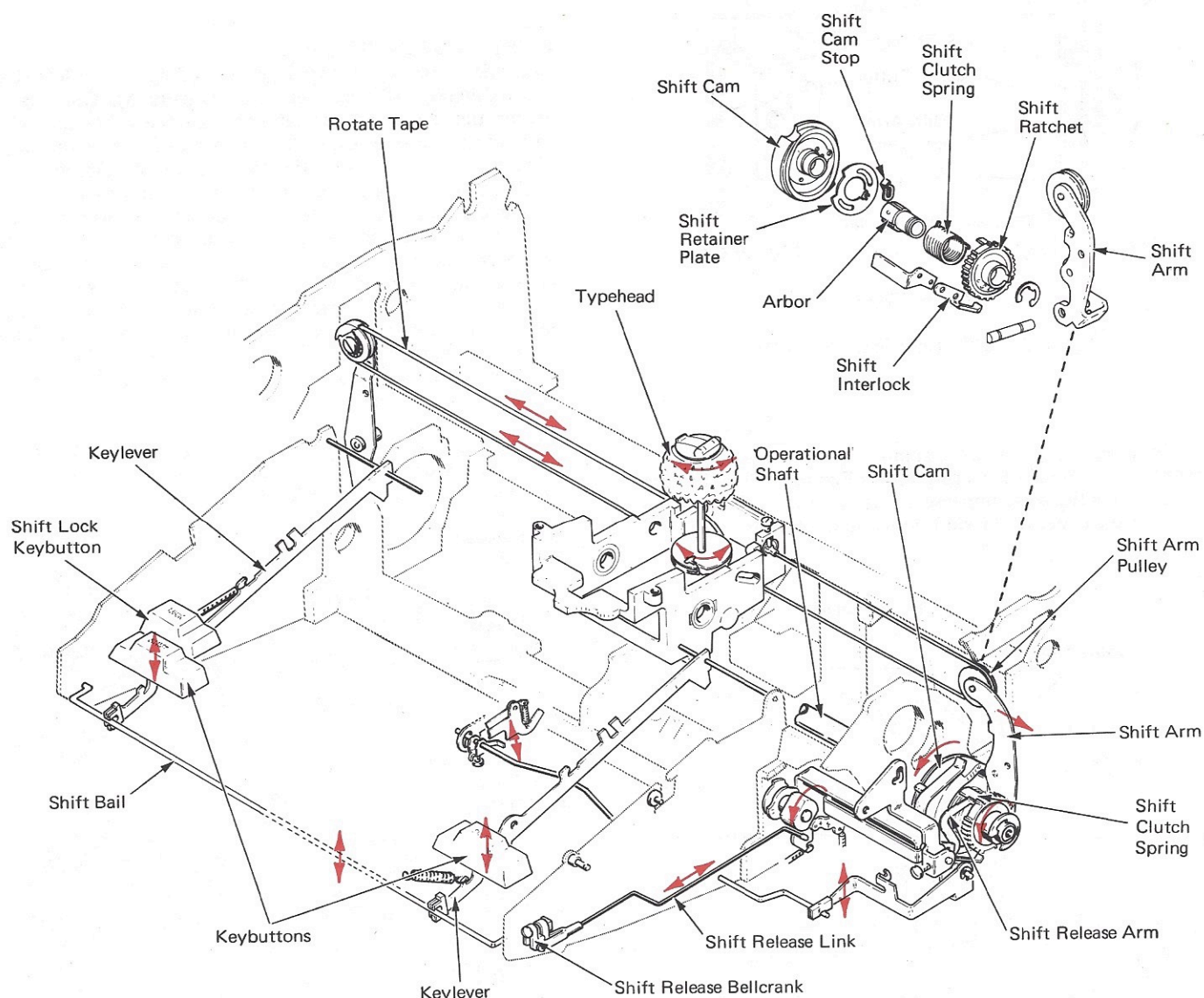


Figure 1 - Shift Mechanism

SHIFT CAM BRAKE

Shift cam overthrow is a greater problem in returning the machine to lower case than in shifting to upper case. This is due to the acceleration received from the pressure of the shift arm roller against the receding surface of the shift cam. To prevent excessive noise and possible parts breakage, a raised braking surface on the shift cam contacts a shift cam brake arm. The brake arm flexes and acts as a heavy spring when returning to lower case and prevents acceleration of the shift cam (Figure 6).

NOTE: Early level machines have a nylon shoe mounted on the shift cam brake where it contacts the shift cam.

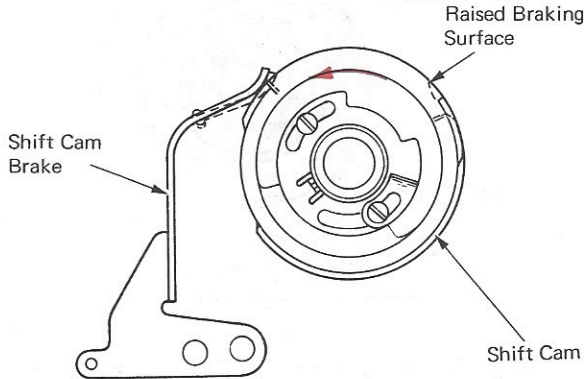


Figure 6 - Shift Cam Brake - (Right Side View)

SHIFT DETENT AND CHARACTER INTERRUPTER

Pivoted on a stud in front of the shift cam is the shift detent arm. The shift detent arm detents the shift cam in position and operates the character interrupter mechanism. The character interrupter mechanism prevents the operation of a character anytime the shift is in process. The character interrupter pawl is rotated into the path of the cycle clutch latch pawl and prevents the release of the cycle clutch. This interlocking action does not prevent the depression of a keylever or an interposer. The interposer is latched down into storage. When the shift operation is completed, the detent enters a recess in the cam removing the character interrupter pawl from in front of the cycle clutch latch link (Figure 7).

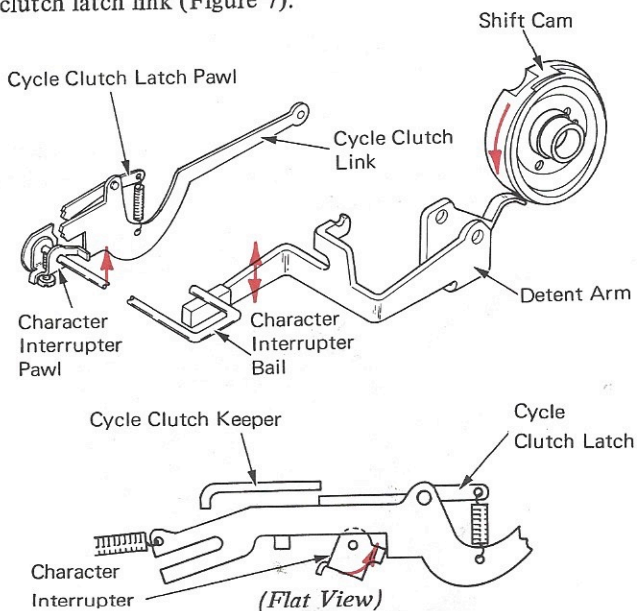


Figure 7 - Character Interrupter (Right Side View)

SHIFT INTERLOCK

If the shift mechanism is tripped during a print character cycle, the shift interlock prevents the shift from operating until the character cycle is completed. The shift interlock operates from a cam mounted to the filter shaft. Each time the filter shaft turns, the shift interlock is positioned into the shift clutch ratchet to prevent a shift operation (Figure 8).

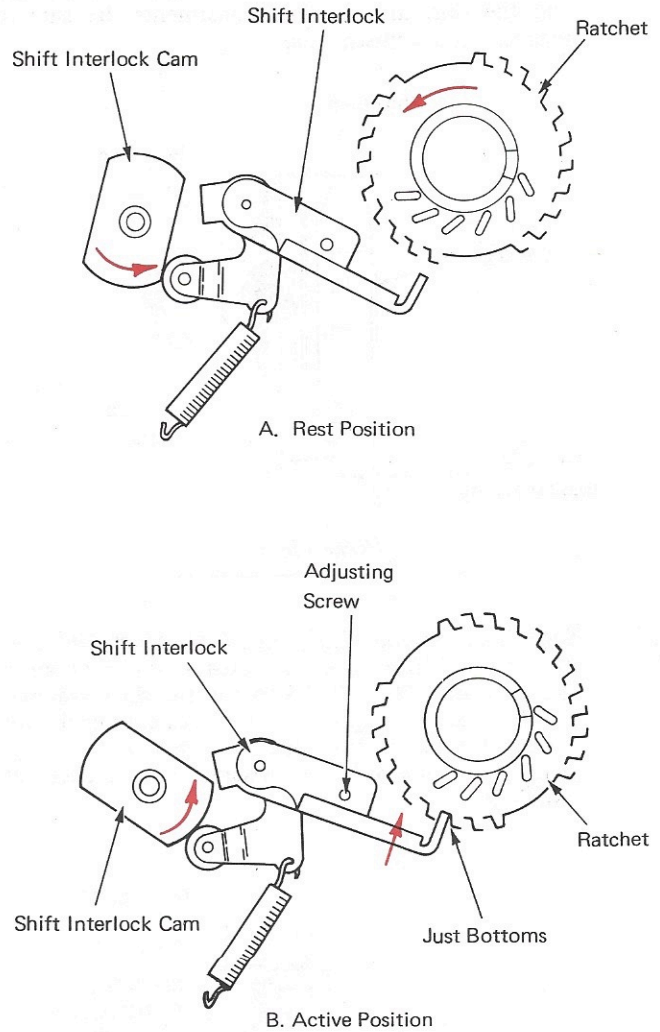
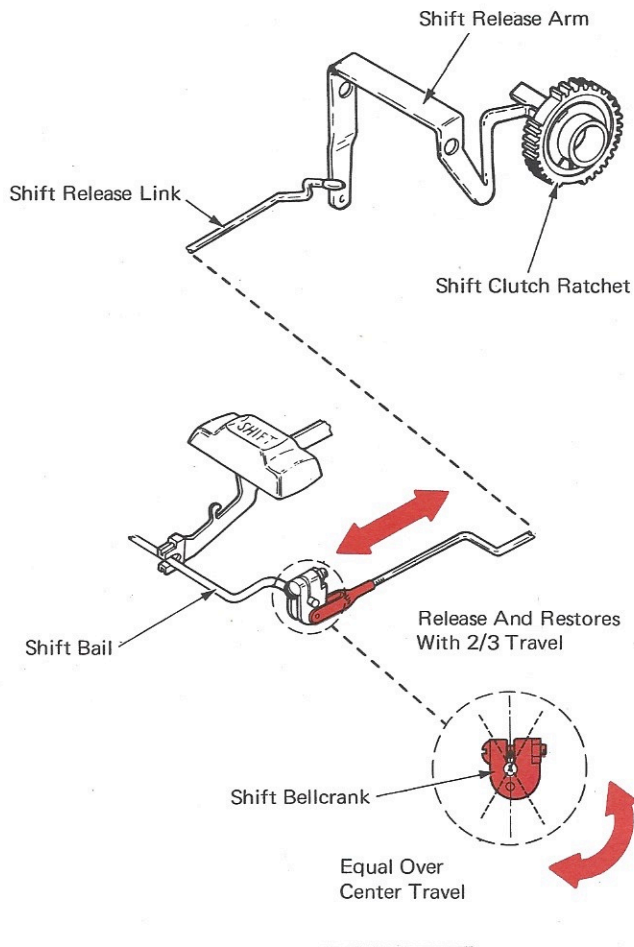
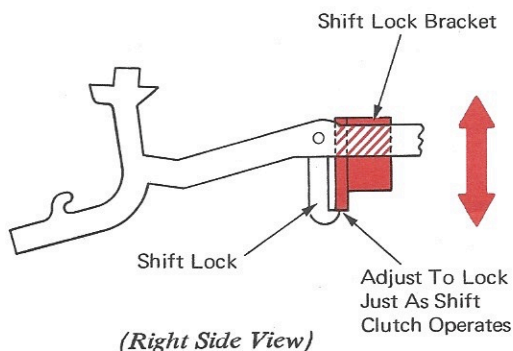


Figure 8 - Shift Interlock (Right Side View)

6. **Shift Release** — Position the shift bellcrank rotationally on the shift bail to have the same over center travel in both directions. Adjust the shift release link so release occurs when the keylever is depressed two-thirds of the way down. As the keylever is allowed to restore from a fully depressed position, the shift should again operate when two-thirds travel of the keylever has been reached. A balance between the two releasing points ensures proper adjustment.

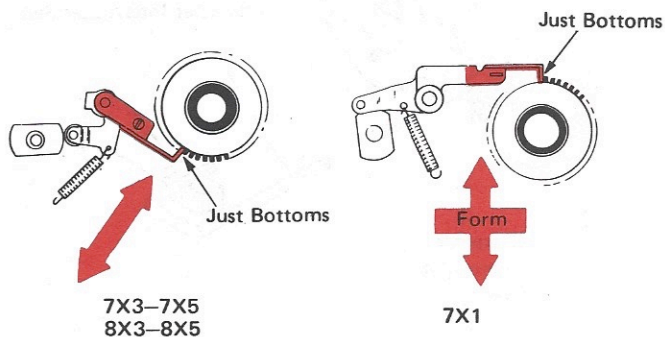


7. **Shift Lock** — Adjust the shift lock bracket vertically so the shift lock engages just as the shift operates or slightly afterward. The lock should not engage before the shift release occurs. The shift lock must be released easily by depressing either shift keybutton.



8. **Shift Interlock** — The shift interlock must be adjusted to satisfy the following condition:

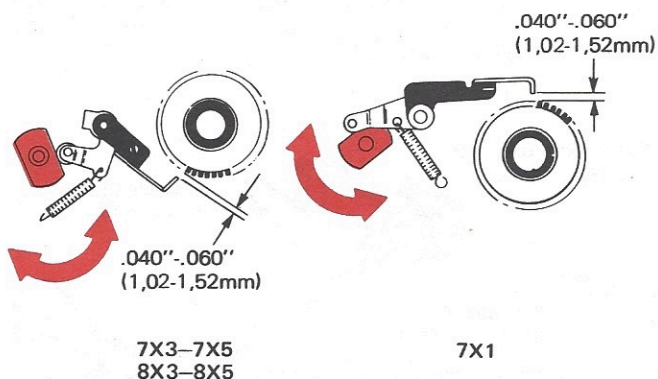
With the interlock follower on the high point of the interlock cam, the tip of the interlock should just bottom between two teeth on the ratchet. Adjust the interlock by its adjusting screw on XX3-XX5 machines to satisfy this condition or form the interlock on 7X1 machines.



(Right Side View)

9. **Shift Interlock Cam** — With the cycle clutch latched at rest and all backlash of the cycle shaft and filter shaft removed in the operating direction, adjust the cam until a clearance of .040"-.060" exists between the tip of the interlock and the top of the tooth on the shift clutch ratchet.

CAUTION: Be sure the interlock cam is in the correct sector of its orbit. This can be checked by tripping the cycle clutch and hand cycling a character. The interlock must move toward the shift ratchet immediately.



(Right Side View)

FINE ALIGNMENT OPERATIONAL THEORY

Fine alignment is defined as locking and supporting the typehead in place so that the desired character will print clearly. In this section we will discuss how the typehead is detented and locked into position for printing. The desired character is brought to the approximate print position in front of the platen by the selection mechanism. Just prior to printing, the typehead must be detented in position both horizontally and vertically. After the print operation

occurs, the tilt and rotate detents are withdrawn, allowing the selection mechanism to return the typehead to rest (Figure 1).

The carrier assembly is supported in front by the print shaft. The print sleeve is keyed to the print shaft, causing it to turn when the print shaft rotates. The print sleeve turns within two bearings in the carrier casting (Figure 1).

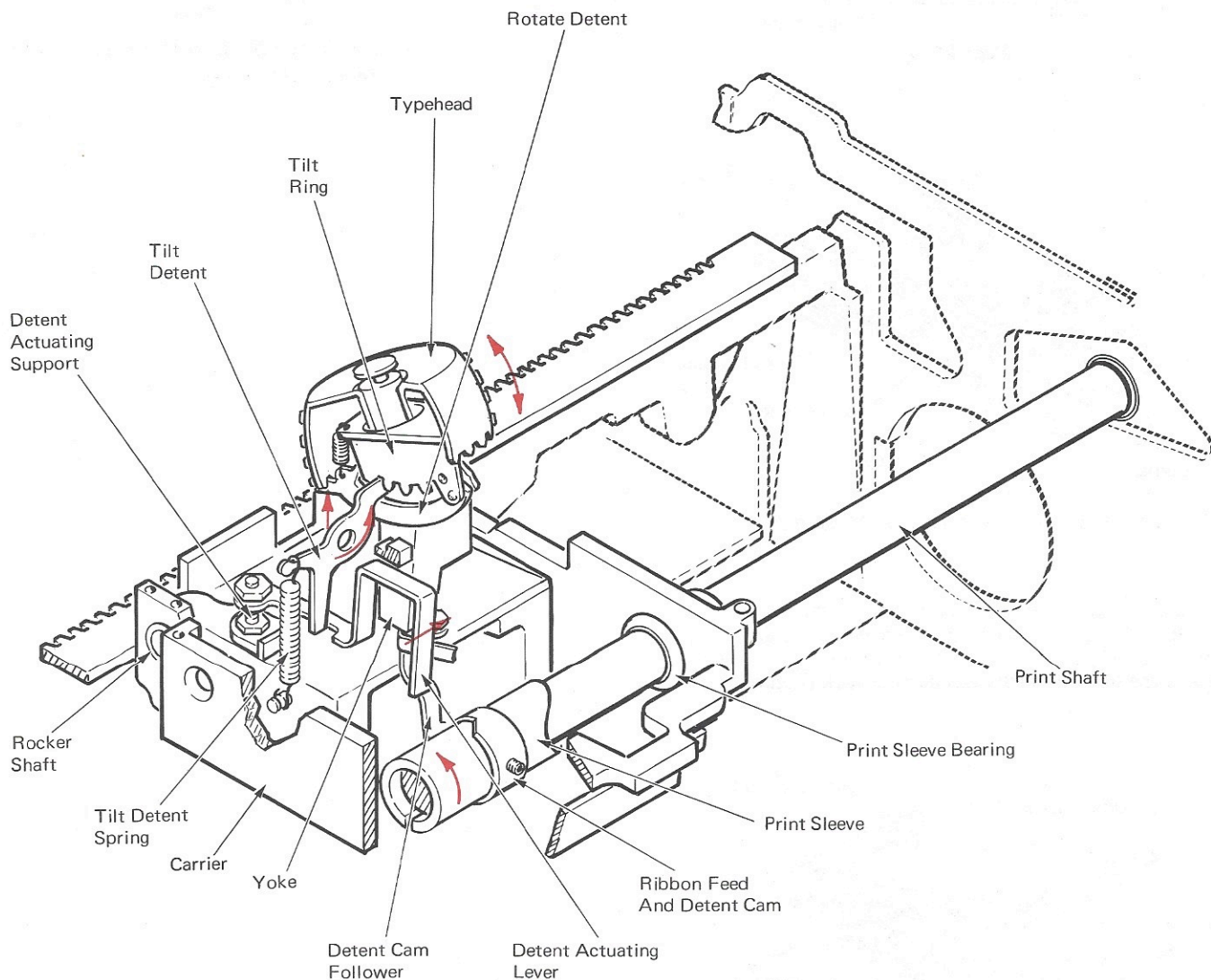


Figure 1 – Tilt And Rotate Detents

ROCKER

Located within the rear portion of the carrier is the rocker (Figure 5). The rocker assembly pivots about the rocker shaft at the rear of the carrier.

Attached solidly to the top of the rocker platform is the yoke (Figure 5). The yoke has two arms that extend up to provide a mount for two pivot pins. The pivot pins are adjusted to provide a tight pivot point for the tilt ring. Mounted at the top of the tilt ring is the upper ball socket to which the typehead is attached. The upper ball socket must be a tight fit with no binds. This is achieved by using shims under the tilt ring spacer.

The level 2 tilt ring has an elongated hole to allow the upper ball socket to be spring loaded to the front of the machine. This keeps the tilt ring backup shoe in contact with the inside of the element providing a more consistent print impact.

On the level 1 tilt ring, the hole is not elongated to allow front-to-rear motion.

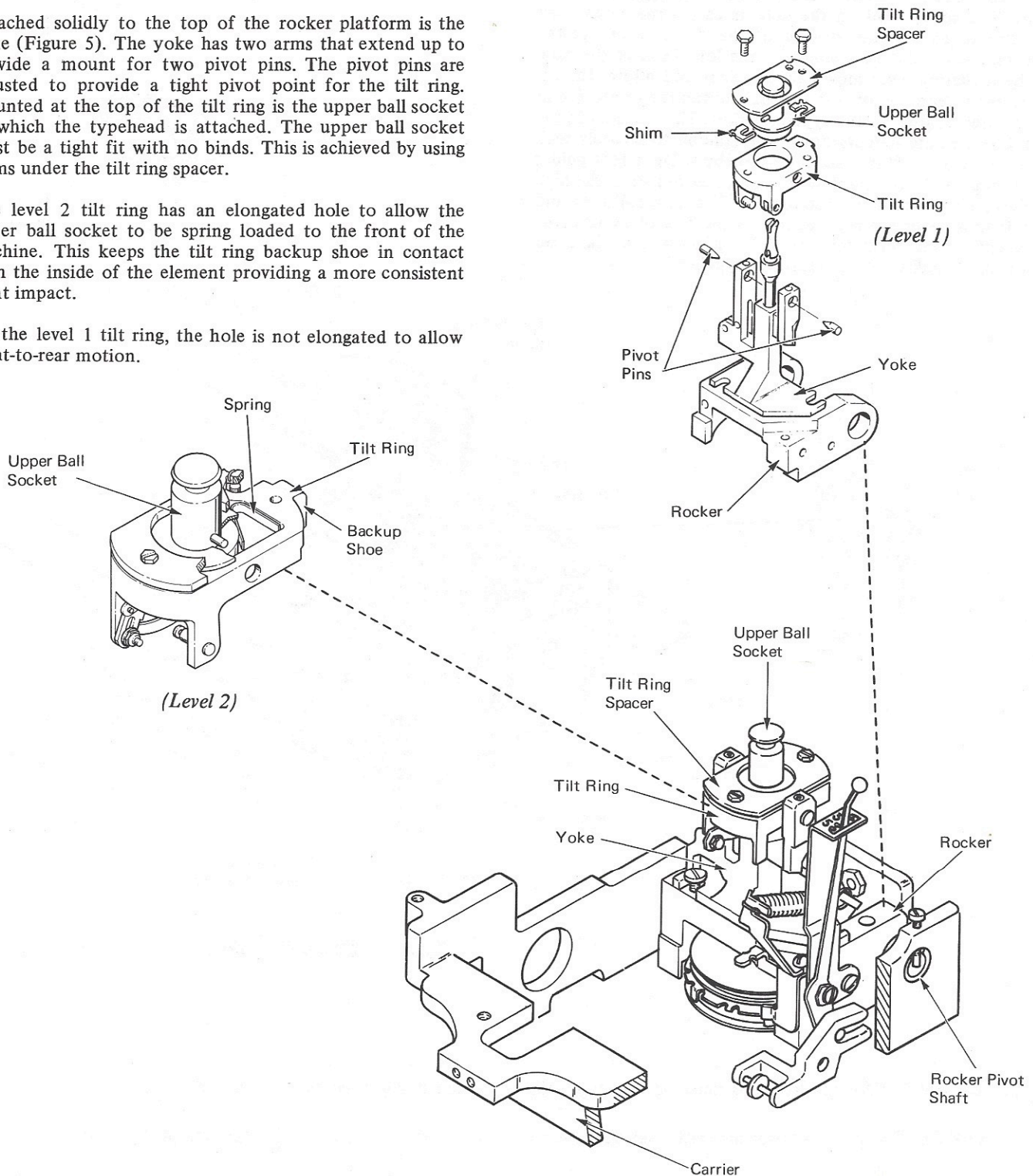


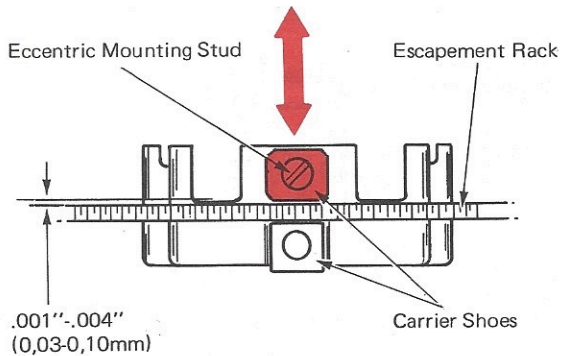
Figure 5 – Rocker Assembly

FINE ALIGNMENT ADJUSTMENTS

1. Carrier Shoe –

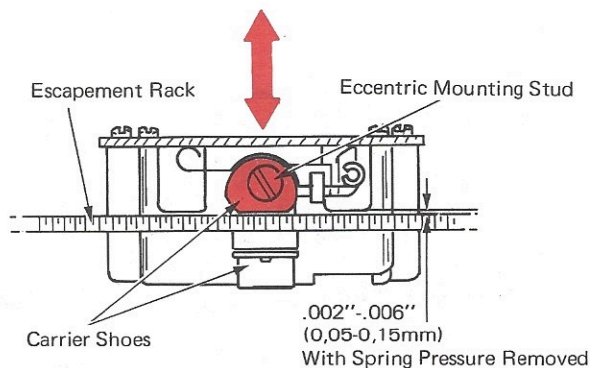
Level 1 – Adjust the eccentric mounting stud to obtain .001"-.004" vertical play between the carrier shoes and the escapement rack.

NOTE: This amount of vertical play assures free horizontal movement of the carrier, yet restricts vertical movement to help prevent variation in the vertical alignment of the type characters.



(Level 1 – Rear View)

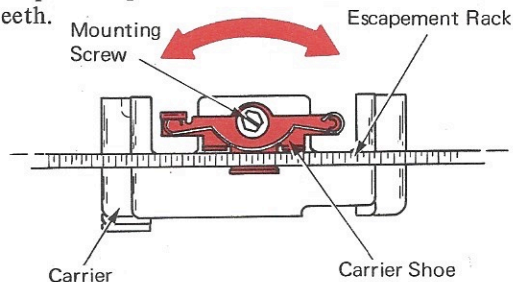
Level 2 – Adjust the eccentric to obtain .002"-.006" vertical movement with the spring pressure removed.



(Level 2 – Rear View)

Level 3 Parallel – Loosen mounting screw on carrier shoe. Press down firmly on rear of carrier, keeping carrier shoe parallel with escapement rack, tighten screw.

NOTE: On dual pitch machines ensure that the escapement pawl is centered in the escapement rack teeth.

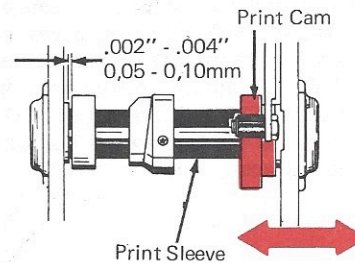


(Level 3 – Rear View)

2. **Print Sleeve End Play** – The print sleeve must have .002"-.004" side play.

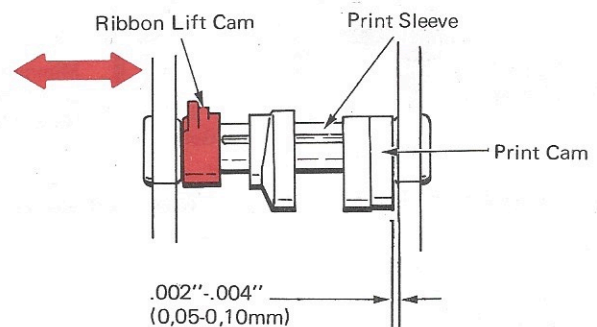
Level 1 Predual Impression – The setscrew in the ribbon lift cam should first be tightened into the dimple and the print cam adjusted left-to-right to obtain the print sleeve end play.

NOTE: Check radial adjustment of print cam after making this adjustment.



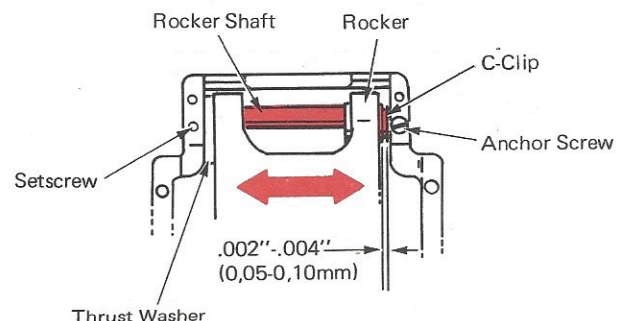
(Level 1 – Predual Impression) (Top View)

Level 2 Dual Impression – The adjustment is obtained by adjusting the ribbon lift cam left-to-right. The print cam setscrew should first be tightened into the dimple in the print sleeve.



(Level 2 – Dual Impression) (Top View)

3. **Rocker End Play** – Adjust the rocker shaft to obtain .002"-.004" end play. The end play exists between a C-clip around the shaft at the right of the rocker and a thrust washer against the carrier casting at the left of the rocker. The rocker shaft is held in place by a setscrew at the left end of the rocker shaft in the carrier casting. This adjustment should be kept to the minimum side of the specification with no binds.

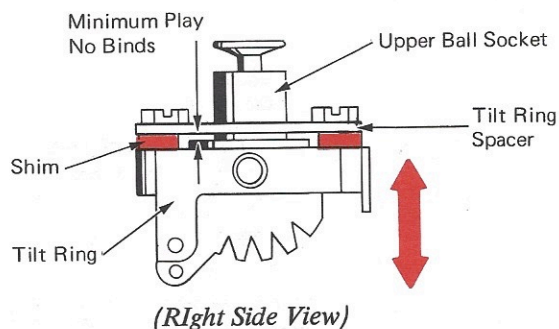


(Top View)

6. Upper Ball Socket –

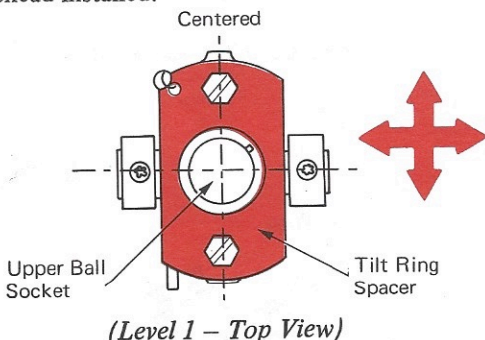
- Shim the tilt ring spacer so there is no vertical play in the upper ball socket but it is still free to rotate.

NOTE: Vertical play in the upper ball socket will affect vertical alignment and impression because the typehead will not maintain a definite position when printing.



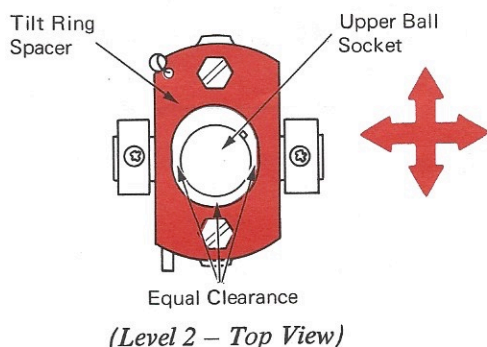
- Level 1 – Position the tilt ring spacer front-to-rear and left-to-right so that the upper ball socket is centered in the tilt ring spacer.

NOTE: A bind in the upper ball socket can result in poor horizontal alignment if the rotate detent fails to seat in the detent notch before print occurs. A bind can also cause the nylon roller to drop, on compensator equipped machines, during a negative selection. Binds in the carrier area can be detected by manually operating the shift arm in and out with the typehead installed.



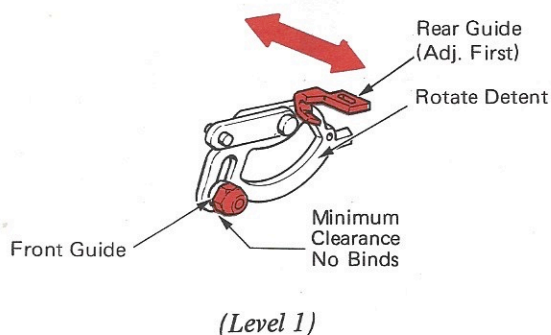
Level 2 Spring Biased Tilt Ring – Position the tilt ring spacer front-to-rear and left-to-right so that there is equal clearance between the upper ball socket and the front and both sides of the opening in the tilt ring spacer.

NOTE: To prevent malselection, all type elements used with this tilt ring must be lubricated with a light film of No. 23 grease on the inner surface.

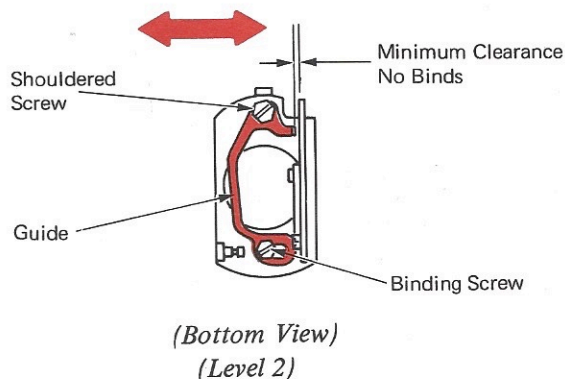


- Rotate Detent –** Adjust the front and rear rotate detent guides so the detent will operate vertically with no binds, but has no horizontal movement. This adjustment should be checked by half cycling a three tilt zero rotate character and checking for rotational movement of the typehead. Excessive play in the rotate detent will cause poor horizontal alignment because the detent will not positively position the typehead.

On machines equipped with level 1 detent guide, this adjustment can be made with the tilt ring off of the machine. Loosen the front guide nut approximately a half turn to assure that it will not interfere while adjusting the rear guide. Remove the rotate detent spring and adjust the rear rotate detent guide until a very slight amount of friction exists as the rear tip of the detent is moved up and down. It should be noted that the rear guide is on an angle and the closer the detent travels to the tilt ring, the tighter it will be wedged. Reconnect the rotate detent spring and adjust the front guide adjusting nut until it restricts the rotate detent from being pulled to its seated position by the rotate detent spring, then loosen the nut until the detent snaps into place. If you removed the tilt ring, do not reinstall at this time.



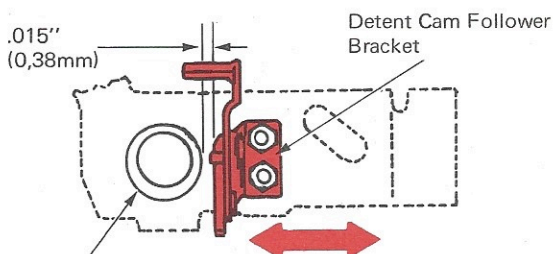
On machines equipped with the level 2 detent guide, the tilt ring can remain in the machine while making this adjustment. Loosen binding screw, then retighten until snug. Move the detent guide left or right until minimum side play and no binds exists between the rotate detent and its guide. Retighten binding screw. The front guide is adjusted in the same manner as the level 1 detent guide.



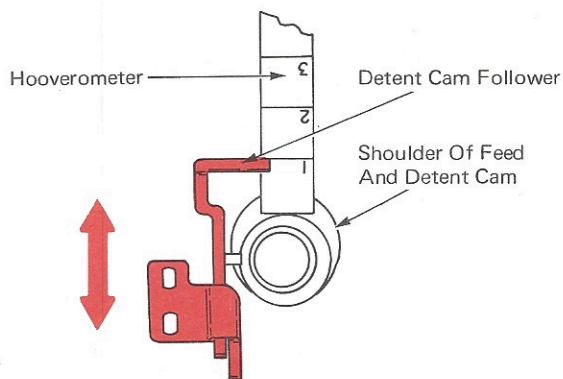
10. **Detent Cam Follower** — The detent cam follower mounting bracket should be adjusted to satisfy the following conditions:

- Front-to-rear for a clearance of .015" between the print sleeve and the end of the pin on the cam follower.
- Vertically so the top of the cam follower is in line with the No. 1 scribe line on the Hooverometer with the Hooverometer resting on the shoulder of the detent cam.

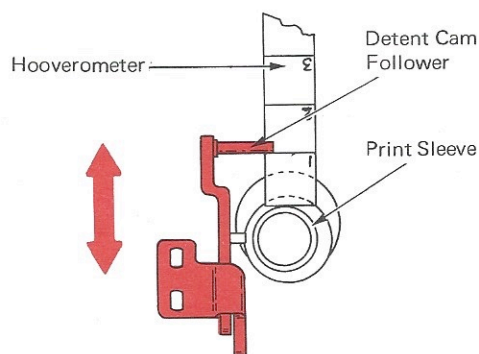
NOTE: Machines equipped with a roller on the detent cam follower should be positioned so the bottom surface of the pin is in line with the No. 1 scribe line.



Front-To-Rear Adjustment (Right Side View)



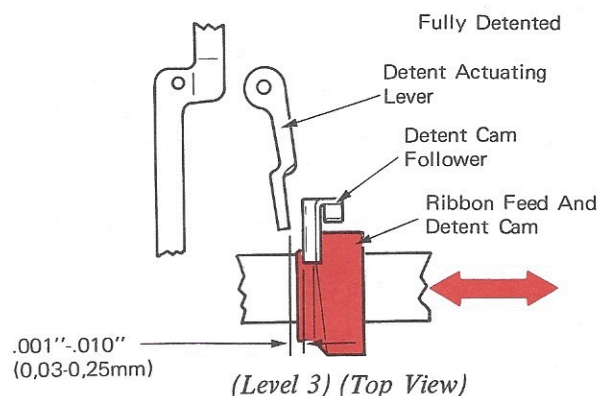
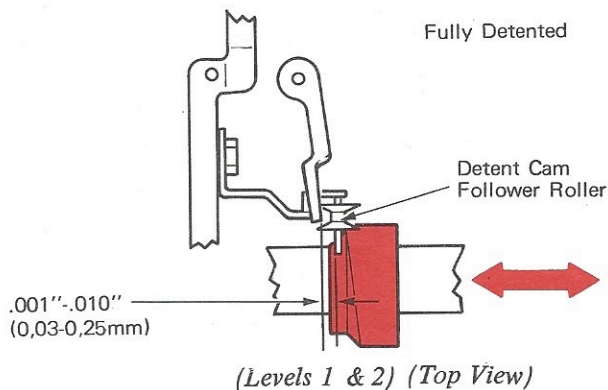
Vertical Adjustment (Left Side View)



Roller Detent Cam Follower (Left Side View)

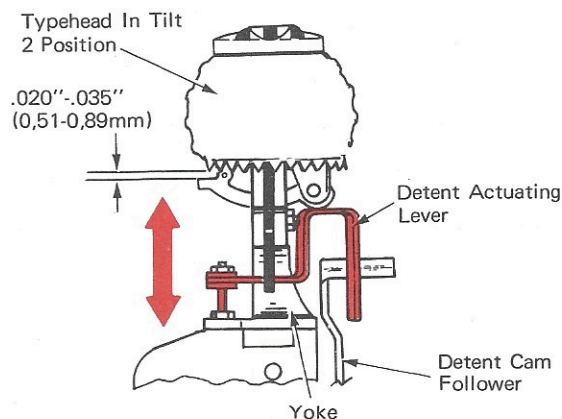
11. **Detent Skirt Clearance** — To obtain detent skirt clearance, adjust the detent cam and the detent actuating lever to satisfy the following conditions:

- With the detent cam follower on the low dwell of the cam, adjust the ribbon feed/detent cam left or right for .001"-.010" clearance between the detent actuating lever and the detent cam follower roller. Make sure that the tilt and rotate detents are fully seated.



- With the cycle shaft at rest and the typehead manually held at the tilt two position, adjust the detent actuating lever support screw up or down for .020"-.035" clearance between the rotate detent and the teeth on the typehead skirt.

NOTE: These two adjustments may affect each other and should be adjusted alternately to obtain the correct clearances.



(All Levels) (Left Side View)

The purpose of the character selection mechanism is to position the typehead in the desired character or symbol position for printing (Figure 1). At rest, the position of the typehead is such that the middle character of the upper band is in position to strike the platen. If any other character is desired, the typehead must be tilted and/or rotated.

The character selection mechanism consists of two submechanisms: tilt selection and rotate selection. The tilt and rotate mechanisms transfer motion through their tape systems to tilt and rotate the typehead. The keyboard (see Keyboard Operational theory) initiates the selection for the amount of tilt and rotate motion needed for each individual character.

The components of the character selection mechanism covered in this section only tilt and rotate the typehead to the approximate character position. This is referred to as coarse alignment. Further positioning and locking of the typehead prior to printing is referred to as fine alignment and is covered in the Fine Alignment Section of this manual.

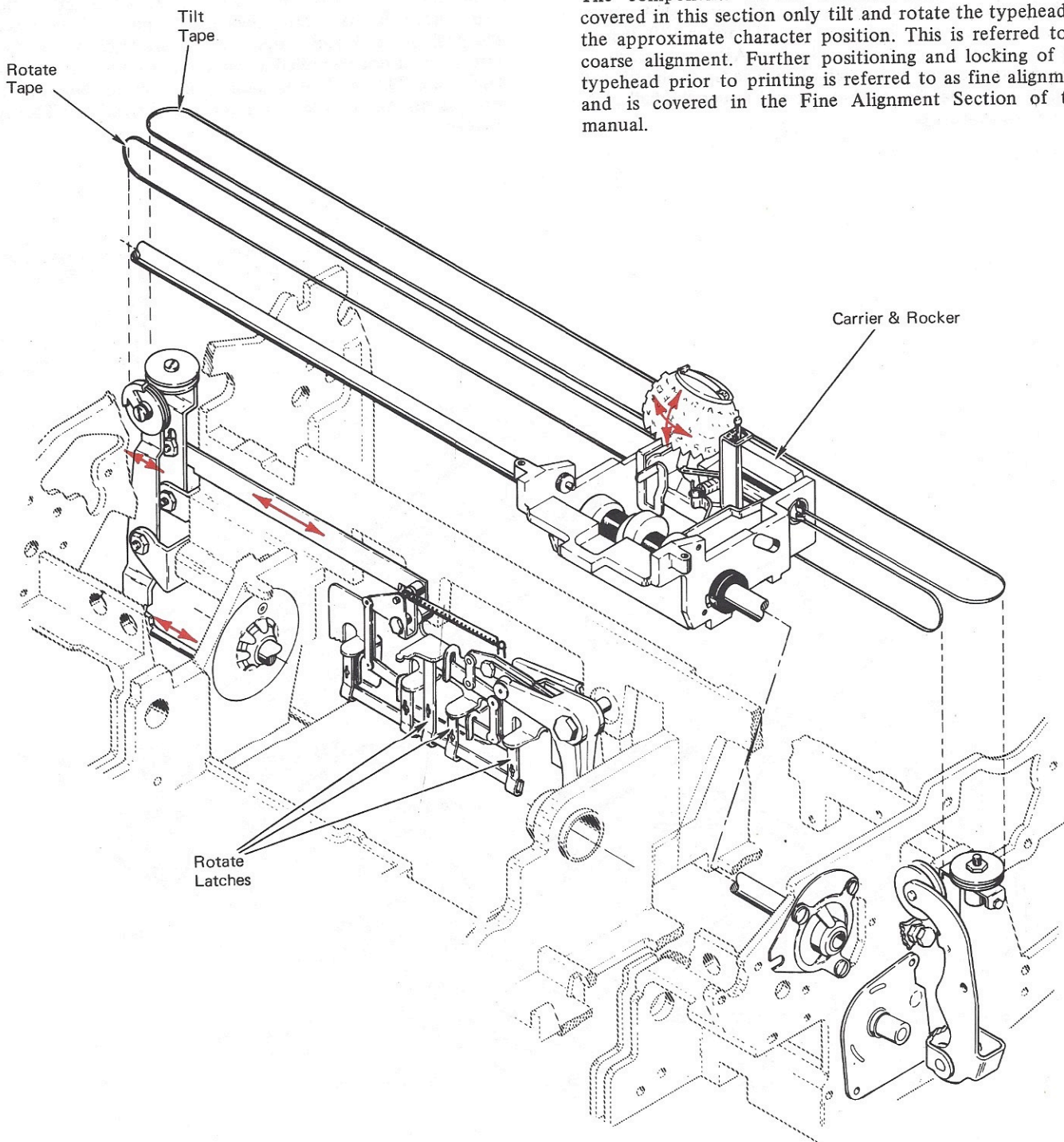


Figure 1 – Character Selection

TILT MECHANISM

The purpose of the tilt mechanism is to position the typehead vertically to any of the four character bands. This is accomplished by transferring motion from the latch bail through a latch assembly, tilt arm, tilt tape, tilt bellcrank and a tilt ring to tilt the typehead.

TILT DIFFERENTIAL

Two tilt latches are attached at each end of a short lever by ball shouldered rivets (Figure 3). The ball shape of the shoulders allows the latches to pivot in all directions. The lever is attached by a double vertical link to a bellcrank. The bellcrank pivots on a stud at the top of the differential bracket. The connection of the double vertical link is not in the middle of the lever, but is offset so the leverage developed by one tilt latch is twice that of the other.

A horizontal link connects the top of the bellcrank to the tilt arm. Operation of the bellcrank forces the tilt arm to the left to exert a pull on the tilt tape.

The left-hand tilt pulley is mounted to the tilt arm on a ball shoulder pivot screw. This allows the pulley to remain horizontal regardless of the position of the tilt arm. It must remain horizontal to prevent the tilt tape from coming off the pulley.

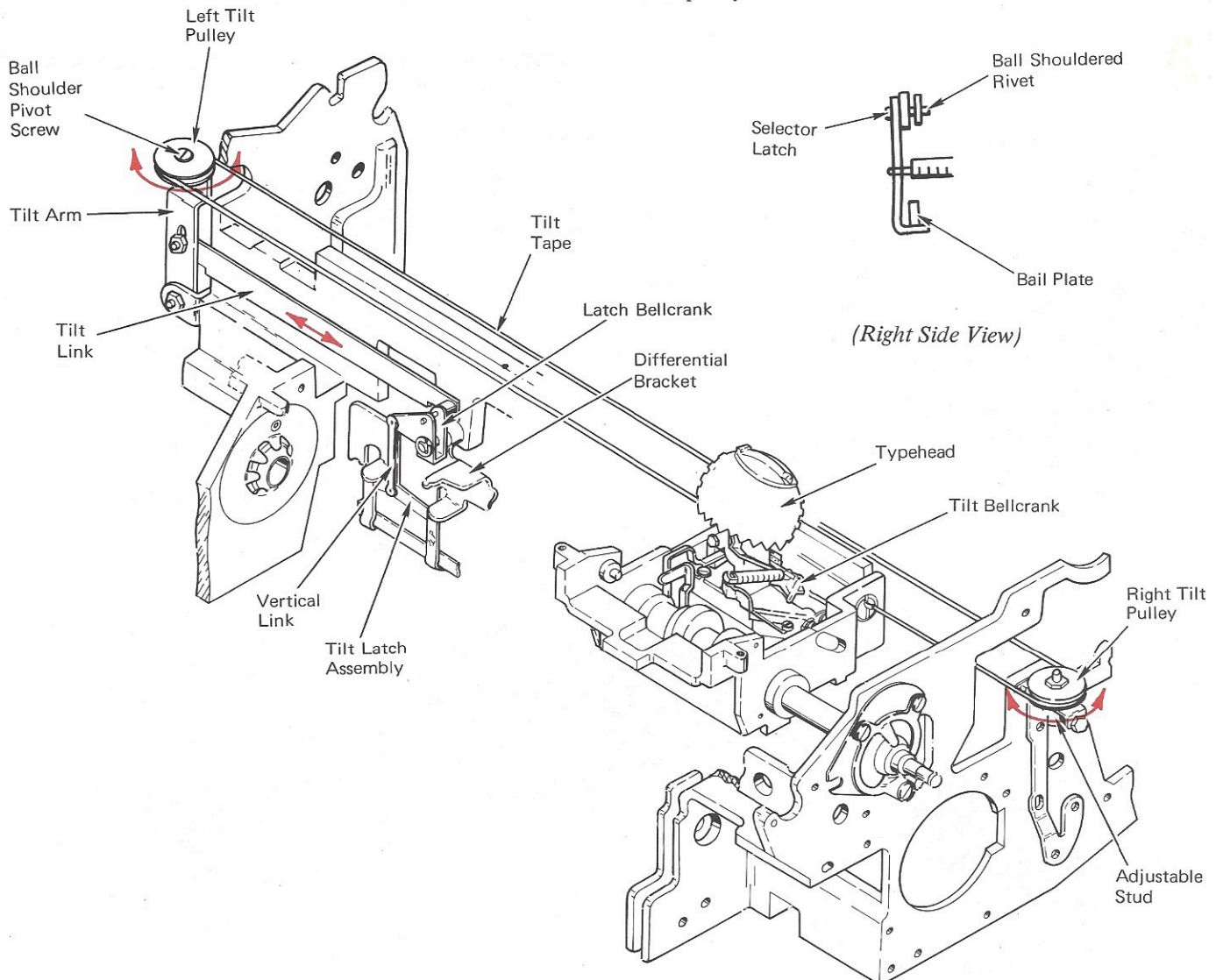


Figure 3 – Tilt Selection Mechanism

TILT 1 OPERATION

The tilt arm is rotated by a pull on the tilt latches. When the tilt 2 latch is held to the front while the tilt 1 latch remains to the rear, only the tilt 1 latch is pulled down by the positive latch bail (Figure 5). As the latch pulls down on the lever, the left end of the lever pivots against a stop pad formed out from the differential bracket. The vertical link from the lever is then pulled to operate the tilt mechanism. This causes the typehead to tilt a distance of one band of characters, and places the second band from the top in the printing position.

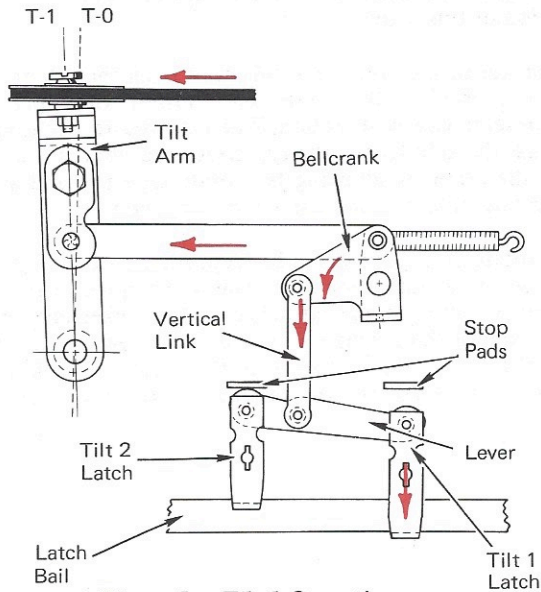


Figure 5 - Tilt 1 Operations

TILT 2 OPERATION

The same type of action occurs if the tilt 2 latch is pulled down by the latch bail while the tilt 1 latch is held forward.

Operating only the tilt 2 latch (Figure 6) develops sufficient movement to cause the typehead to tilt a distance of two bands of characters. The third band is then in the printing position.

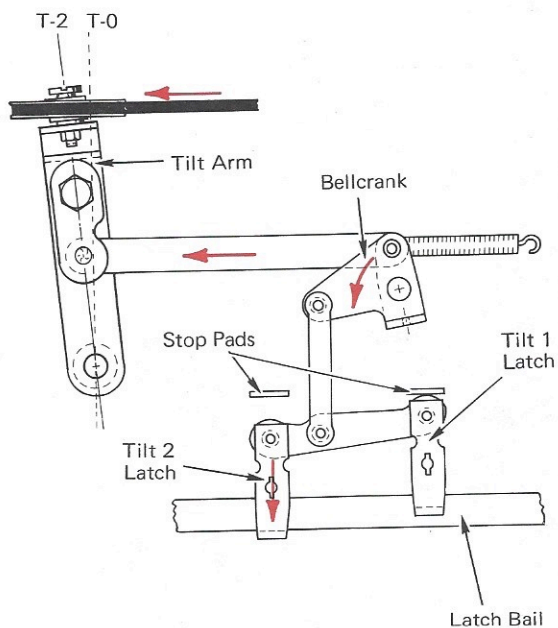


Figure 6 - Tilt 2 Operation

TILT 3 OPERATION

When both latches remain to the rear under the latch bail (Figure 7), both are operated. This causes the double vertical link to receive the same motion as the latches, resulting in three character bands of tilt. The fourth band is then in the printing position.

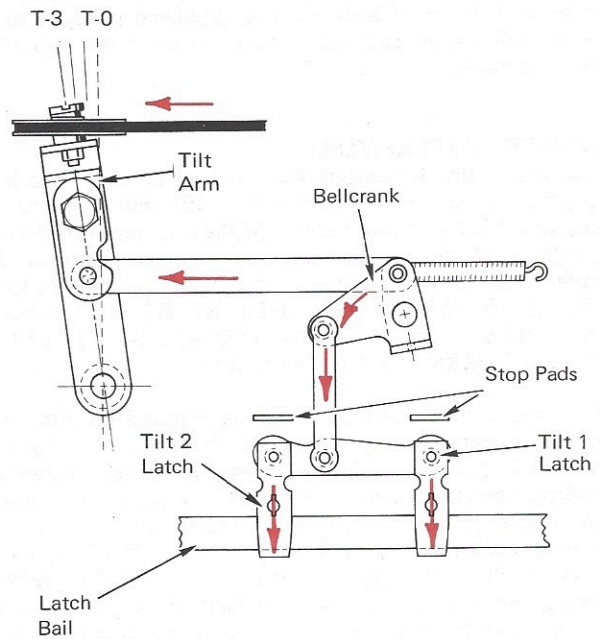


Figure 7 - Tilt 3 Operation

POSITIVE ROTATION

Consider the positive rotation of the typehead first. The three selector latches involved in positive rotation are those farthest to the right under the positive latch bail. They are from left to right, R2A, R1, and R2.

The R1 latch is used for one-character rotation and the R2 latch for two-character rotation. With the R1 and R2 latches combined, as shown in Figure 9, a positive 3 rotate character will be selected. The R2 and R2A latches are operated for a four-character rotation. A five-character rotation is obtained by pulling down the R1, R2, and R2A latches.

An adjustable balance lever at the middle of the rotate differential is connected to the horizontal arm of the rotate bellcrank. It is referred to as the balance lever, because it balances the amount of motion between positive and negative rotation. The right end of the balance lever is held stationary during positive rotation. A downward pull at the left end causes the rotate bellcrank to rotate counterclockwise. The rotate link connects the bottom of the rotate bellcrank to the bottom of the rotate arm. Counterclockwise rotation of the bellcrank causes the rotate arm to pivot about its fulcrum point and exert a pull on the rotate tape.

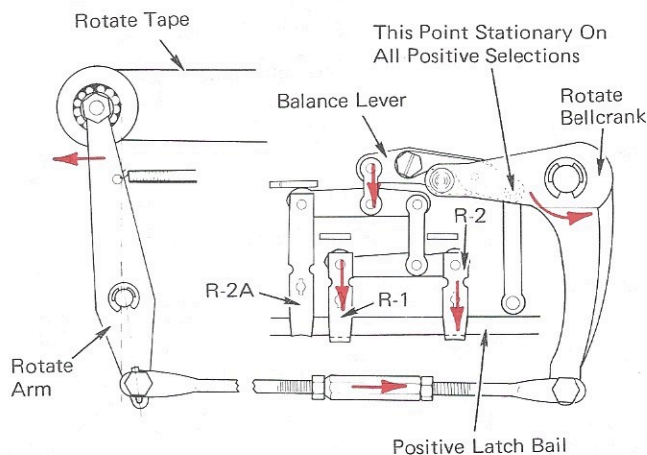


Figure 9 – Positive Three Rotate Operation

NEGATIVE ROTATION

If positive rotation of the typehead is achieved by operating the rotate bellcrank counterclockwise to create a pull on the rotate tape, it follows then that operating the rotate bellcrank clockwise will allow the typehead to rotate in a negative direction.

In order for the bellcrank to rotate clockwise, the right end of the balance lever must be raised. The right end of the balance lever has a flat link connection to the negative latch bail (Figure 10). The negative latch bail is a single arm located under the cycle shaft and pivots on the bail shaft. The bail has a cam follower roller located about mid-point on the bail and at rest, is held down (inactive) by the high point of the right-hand cam on the cycle shaft. When the cycle shaft rotates and the negative latch bail is allowed to rise, the right end of the balance lever rises to allow clockwise operation of the rotate bellcrank.

The high point of the right-hand cam is 90 degrees from the high point of the other two cams. This ensures that when the positive latch bail is driven DOWN to the active position, the negative latch bail can be UP in the active position.

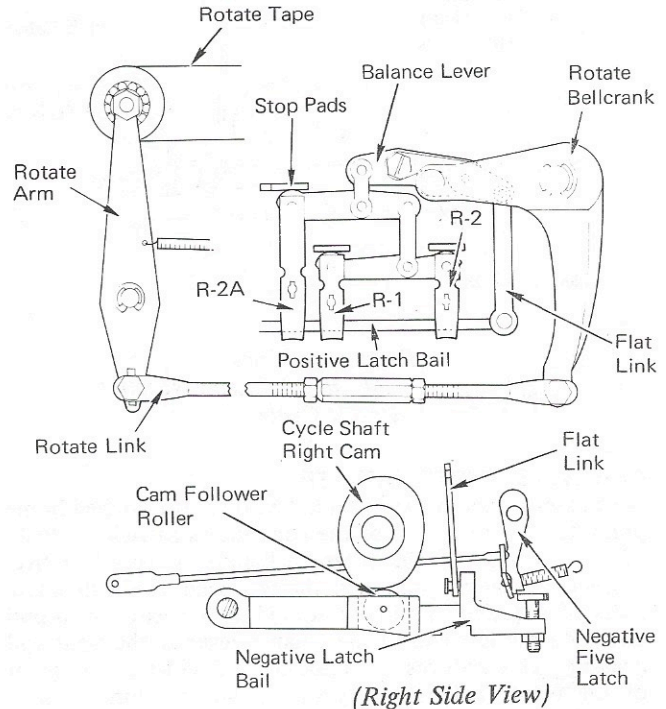


Figure 10 – Negative Latch Bail (At Rest)

The negative latch bail is prevented from rising during a positive rotate operation by the negative five latch (Figure 11).

The latch is mounted to the differential bracket and pivots front-to-rear. In the rest position, the latch is positioned above the head of an adjustable screw at the rear of the negative latch bail. During a positive rotate operation, as the cycle shaft begins to rotate, the bail moves up slightly and is stopped by the negative five latch. The slight amount of upward movement is compensated for by the balance lever adjustment and does not affect the positive rotate selection. This clearance between the negative five latch and the bail adjusting screw at rest ensures resetting of the latch at the completion of a negative rotate cycle.

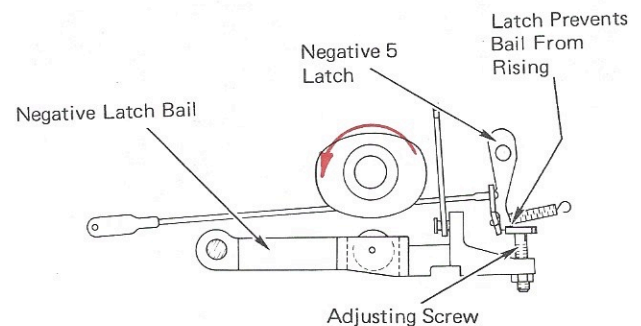


Figure 11 – Negative Latch Bail During Positive Rotate Cycle

Any wear in the system will cause the typehead to drift in the negative direction. This is because of the rotate spring applying a constant pressure to the rotate sytem in a negative direction. Because of this drift, coarse alignment and homing adjustments should be checked each time the machine is visited (Figure 15).

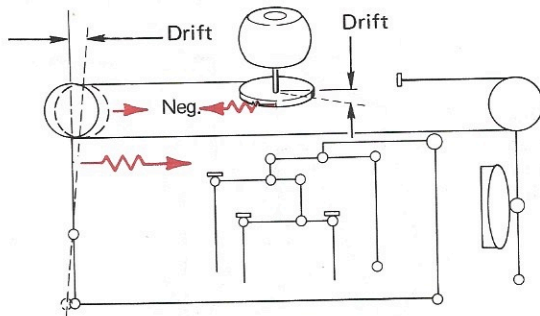


Figure 15 – Rotate System Drift

Early level machines include a wear compensator on the rotate arm (Figure 16). The wear compensator does not prevent wear, but prevents most head drift due to wear in the system. The wear compensator is composed of three basic parts: the rotate arm, the compensating arm, and a nylon roller between them. For all rotate positions between +5 and -3, it works the same as the current solid arm.

Between rotate position -3 and -5 a ratio change occurs and provides the compensating arm with more motion. At the negative 5 position a stud on the rotate arm contacts the side frame and prevents further movement of the rotate arm. Wear in the system would cause the compensating arm to continue moving and allow the nylon roller to drop in its V-shaped wedging slot between the rotate arm and compensating arm, thereby compensating for any system drift.

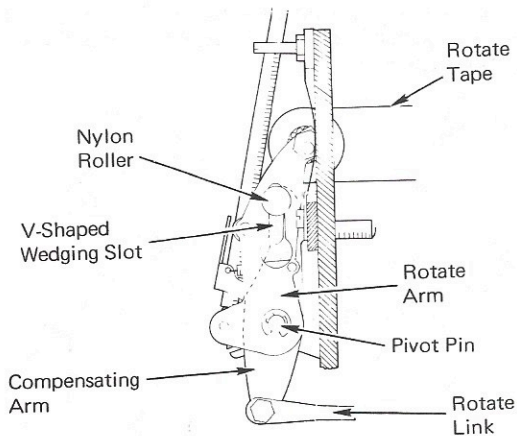


Figure 16 – Basic Components Of The Wear Compensator

Wear potential in the rotate mechanism is defined as the ability of the rotate mechanism to properly align the typehead after a measurable amount of wear is felt in the mechanism (Figure 17).

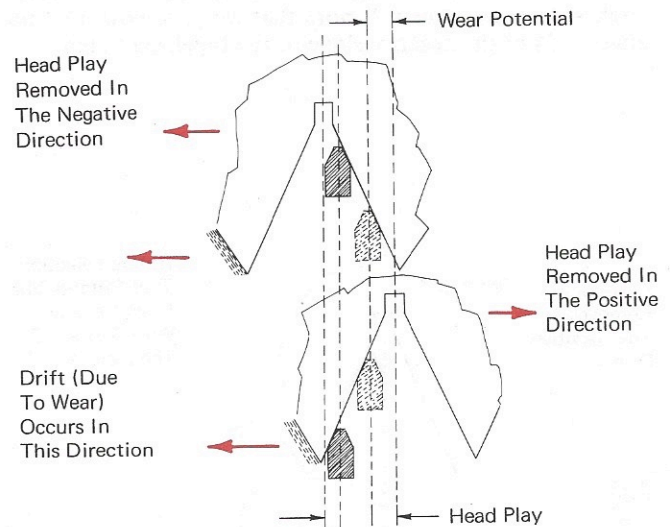


Figure 17 – Wear Potential (Rear View)

A portion of the typehead play provides the rotate system with a substantial amount of wear potential. To explain how this is accomplished let's look at the relationship between head play, homing and bandwidth.

TYPEHEAD PLAY

Typehead play is the free motion in the typehead when the machine is at rest. It is due to the ball joint connection between the upper ball socket and the lower ball socket. The play is .050"-.060" measured at the typehead skirt or slightly less than half the distance between teeth. The head play is split between the positive and negative slopes of the typehead notch (Figure 18). The typehead is homed so that the rotate detent contacts the notch slope, with the head play removed in the negative direction, approximately .015" down the negative side of the notch.

The purpose of this adjustment is to provide maximum wear potential to the system. Also, this adjustment tends to allow more time to withdraw the detent before the typehead restores in the positive direction. Breakage in the system would occur if the detent did not withdraw prior to typehead movement.

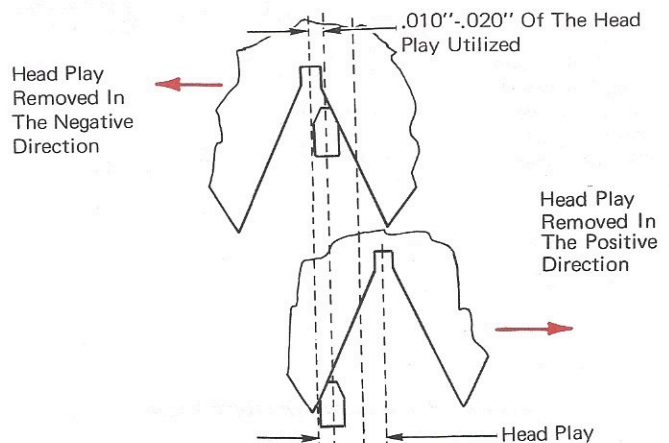
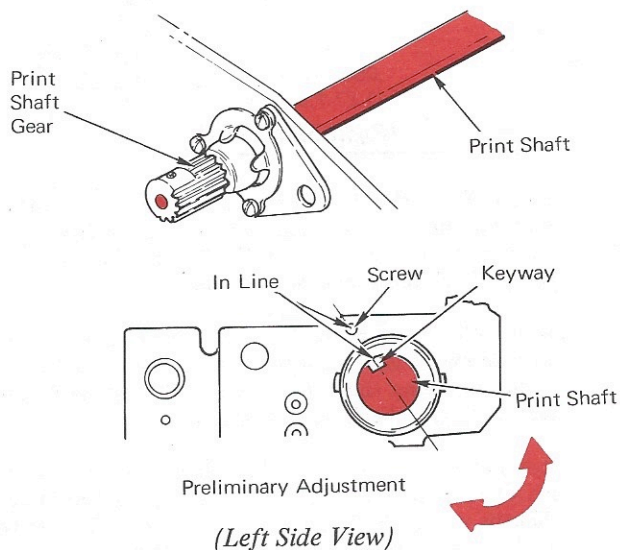


Figure 18 – Typehead Play And Homing (Rear View)

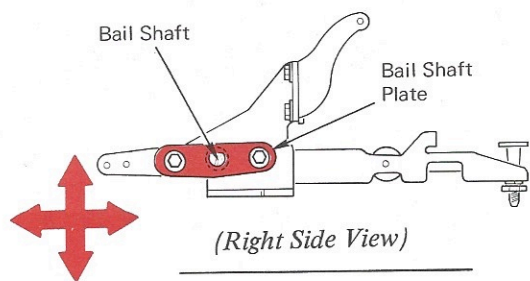
CHARACTER SELECTION ADJUSTMENTS

NOTE: Shift adjustments must be correct before attempting to make coarse alignment adjustments. Remove the typehead before beginning adjustments.

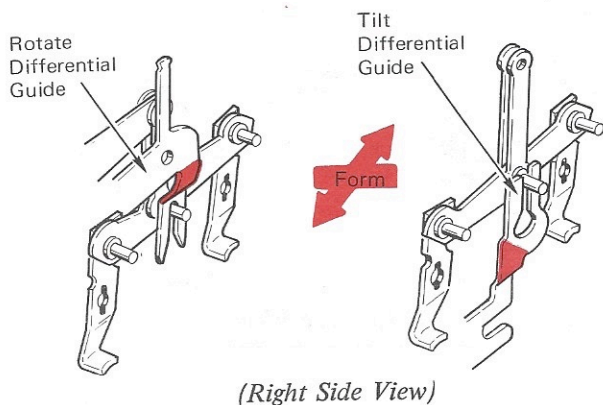
1. **Preliminary Timing** – Loosen the print shaft gear and rotate the print shaft so that its keyway is in line with the screw on the left side of the carrier casting. This coarse adjustment assures that the detents will operate at approximately the right time in the cycle.



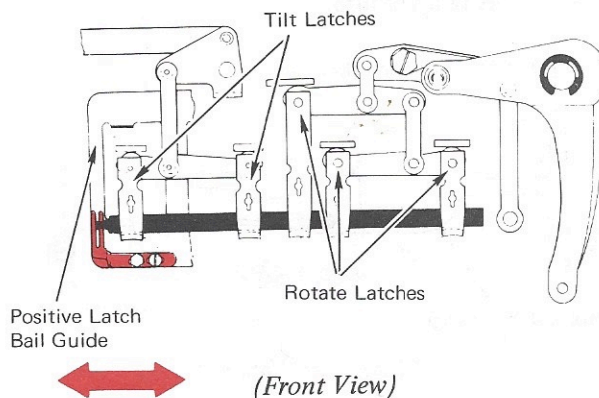
2. **Latch Bail Shaft** – Adjust the bail shaft plate so that the bail shaft is parallel to the cycle shaft.



3. **Rotate Differential Guides** – Adjust the guides left and right so that the vertical link hangs vertically.

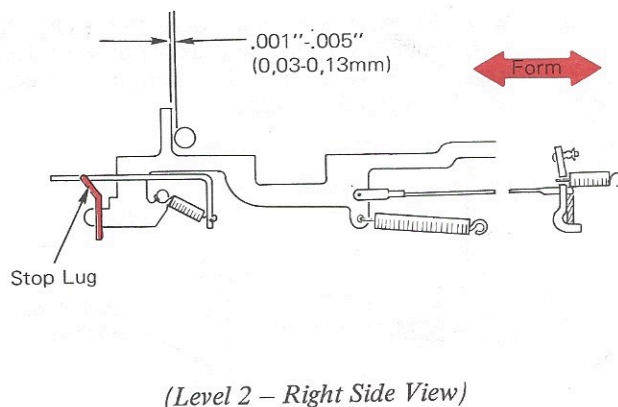
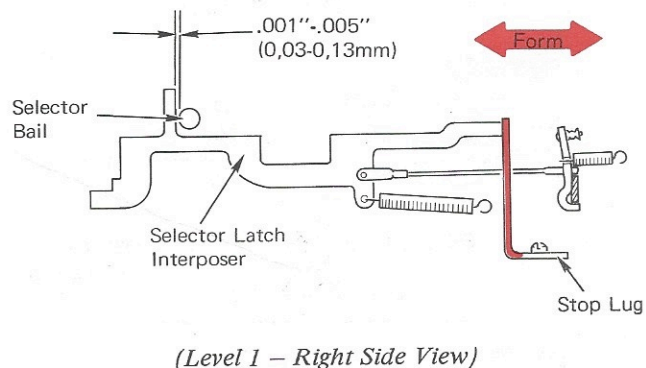


4. **Positive Latch Bail Guide** – Adjust the guide left and right so that the tilt and rotate latches hang vertically.

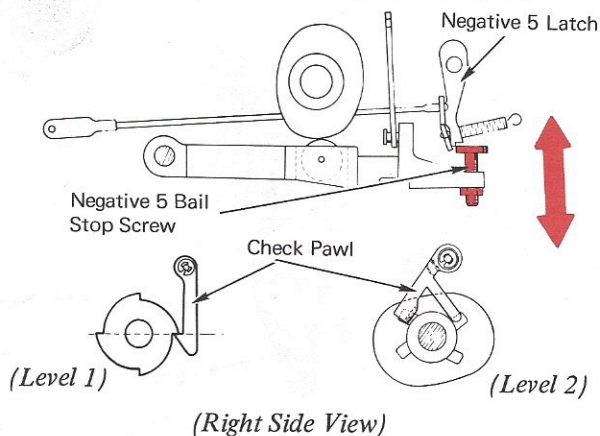


5. **Interposer Stop Lugs (Levels 1 & 2 Only)** – Form the selector interposer stop lugs to obtain .001"-.005" clearance between each latch interposer's upright lug and its respective selector bail. This adjustment establishes a fixed position for the interposers and will directly affect selector latch timing.

NOTE: This adjustment does not apply to late level machines. Refer to adjustment 3.

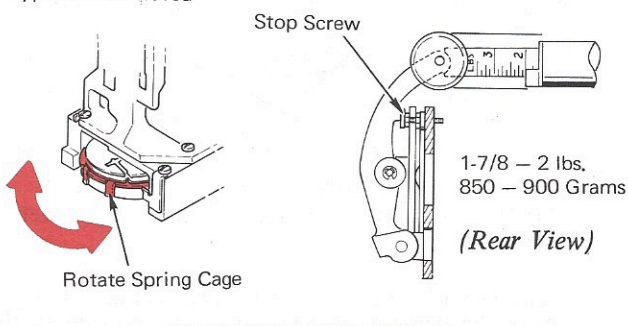


9. **Negative 5 Bail Stop Screw** – Adjust the negative 5 stop screw so that the negative five latch resets at the same time that the cycle clutch check pawl resets when a negative 5 character is slowly hand cycled.

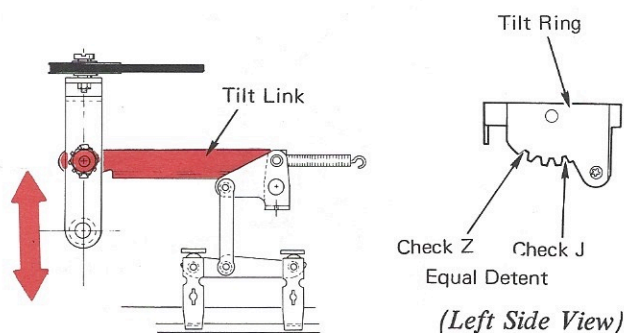


10. **Rotate Spring Tension** – Shift the machine into lower case and half cycle an "m." Adjust the rotate spring cage until a $1\frac{7}{8}$ - 2 lb. reading is obtained on the spring scale just as the shift arm contacts the stop screw. This is a CRITICAL adjustment. Excessive tension will cause increased wear in the system; insufficient tension will not provide the torque necessary for rapid lower case negative rotate operations.

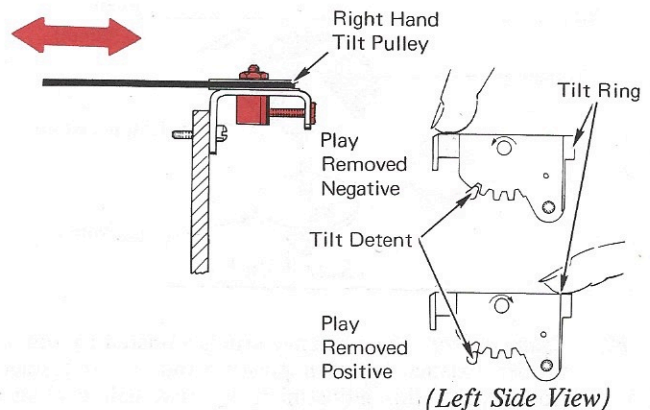
Half Cycled
Lower Case "M"
Typehead Removed



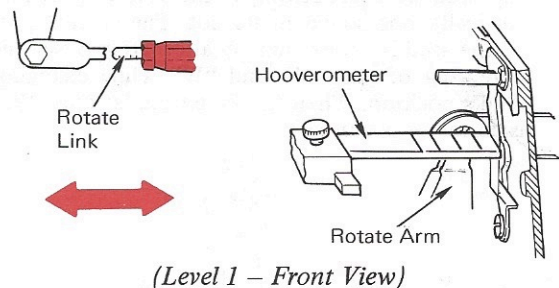
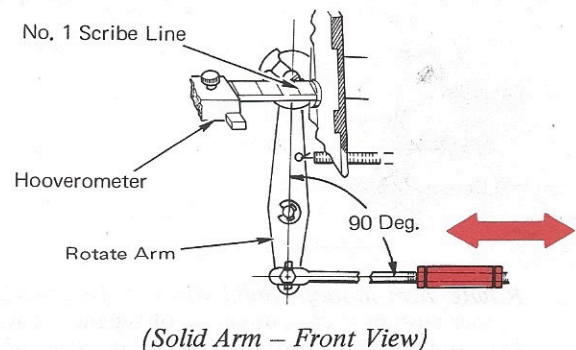
11. **Tilt Arm Motion** – Adjust the link up or down on the tilt arm so that the tilt ring will coarse align the same for a "Z" as it does for a "J."



12. **Tilt Ring Homing** – With a "Z" character half cycled and the tilt ring play removed in the negative direction (restoring direction), adjust the right-hand tilt pulley so the rear of the tilt ring will rise approximately .010" when the detent is manually allowed to seat in the detent notch. As a further check, remove the tilt ring play in the positive direction and observe the detent entry on the forward side of the notch. The detent should enter far down the forward slope of the detent notch, but not so far that it contacts the tip of the tooth.

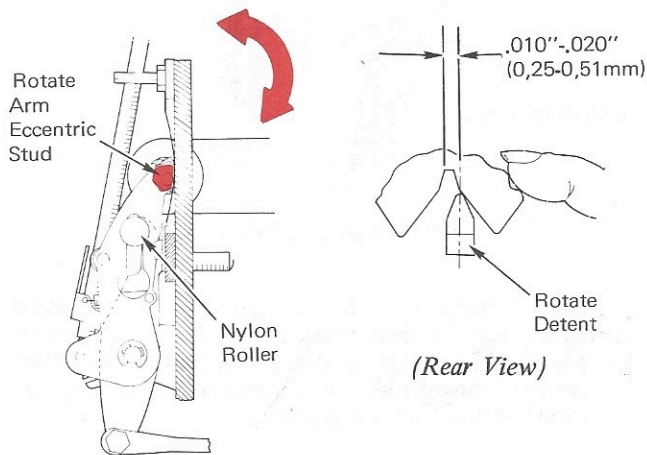


13. **Rotate Arm Vertical (Solid Arm)** – To ensure equal arcs of motion of the rotate arm for both negative and positive characters, the rotate arm must be vertical. This is a preliminary adjustment and is made by adjusting the turnbuckle on the rotate link. Adjust the link so that the center of the top of the rotate arm is in line with the No. 1 scribe line of the Hoovermeter when the Hoovermeter is against the side frame.



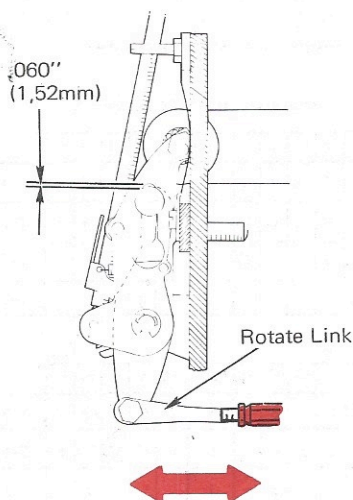
NOTE: The remaining adjustments must be made with the machine in upper case. Reinstall the typehead.

19. **Rotate Arm Eccentric Stud – (Level 1 Only) (Upper Case)** – Half cycle -5 character and raise the nylon roller in its slot to ensure it is not restricting the rotate arm. Adjust the eccentric stud rotationally so the rotate detent contacts the negative slope of the typehead .010"-.020" from the center of the notch. This adjustment allows the greatest amount of wear potential available before a failure can occur.



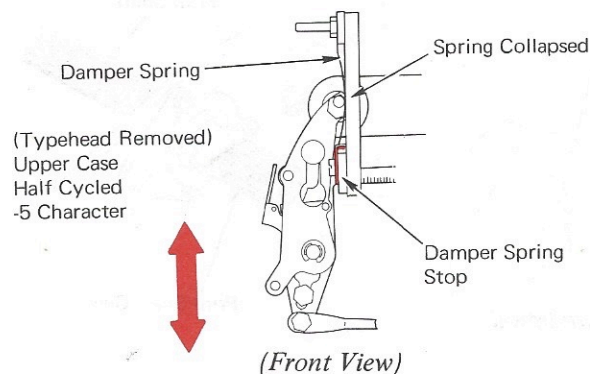
(Front View Upper Case -5 Character Half-Cycled)

20. **Rotate Link – (Level 1 Only) (Upper Case)** – Adjust the rotate link so, with a -5 character half cycled, the nylon roller will drop .060" from the top of the slot. This permits maximum adjustment life of the wear compensator.

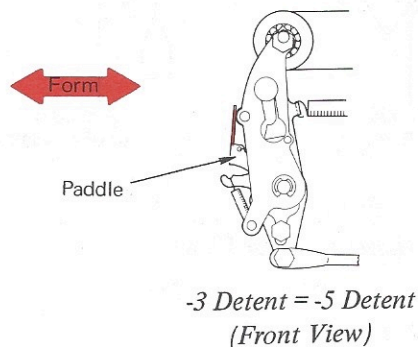


(Front View Upper Case -5 Character Half-Cycled)

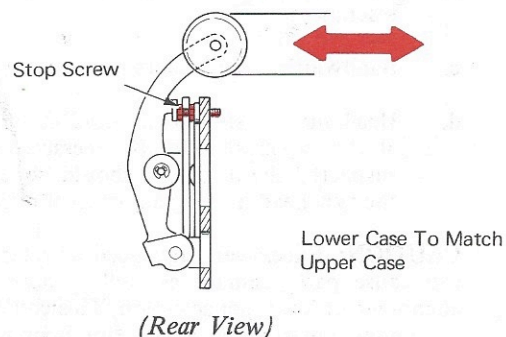
21. **Damper Spring Stop (Level 1 Only) (Upper Case)** – Adjust the damper spring stop vertically so the damper spring will just collapse against the power frame with a -5 character half cycled and the typehead removed.



22. **Ration Change – (Level 1 Only) (Upper Case)** – Form the paddle on the wear compensator assembly so the -3 character detents the same as the -5 character. Each time the paddle is formed, the machine must be recycled (raise the roller and cycle a -5 character) to allow the mechanism parts to seat properly before the adjustment is checked.



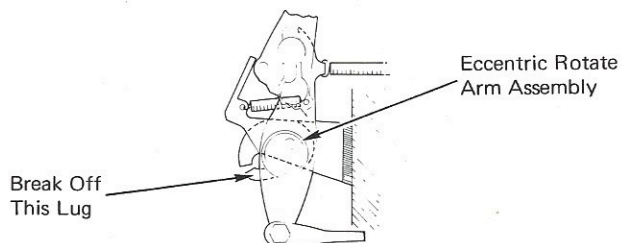
23. **Shift Motion** – Now, shift the machine into lower case so that the shift arm contacts its stop screw. Adjust the stop screw so that a lower case "m" detents EXACTLY the same as an upper case "M."



PROCEDURE FOR CRIPPLING COMPENSATOR-TYPE ROTATE ARMS

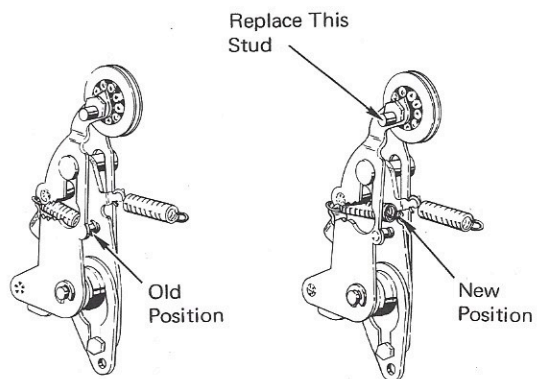
If difficulty is encountered in adjustment or operation of the compensator rotate arm, the following procedure can be used to convert it to a solid arm:

1. Break off the lug on the bottom of the eccentric rotate arm assembly.



Front View

2. Place the wear compensator wedge at the top of the slot.
3. Disconnect the spring from the rotate arm and connect it to the middle compensator arm assembly.



4. Replace the eccentric stud with the pulley stud for the solid arm, and adjust the system the same as you would adjust a solid rotate arm mechanism.

SWITCH PITCH OPERATIONAL THEORY

The purpose of the switch pitch mechanism is to perform the necessary switching operations within the escapement and margin mechanisms to allow the dual pitch "Selectric" II Typewriter to function properly in either 10 or 12 pitch. Both the escapement rack and margin rack are rods with teeth cut into two sides. Ten pitch teeth and 12 pitch teeth are cut into opposing sides of the racks. The racks are retained in cutouts in the escapement and margin rails. This puts the escapement rack teeth and the margin rack teeth in

approximately the same position in the machine as the single pitch escapement and margin rack teeth. Both the margin and escapement mechanisms function in the same manner as the single pitch "Selectric" Typewriter. Therefore, in order to switch pitch it is only necessary to rotate the racks until either the 10 pitch teeth or 12 pitch teeth face the rear of the machine and engage the escapement pawl and margin slider (Figure 1).

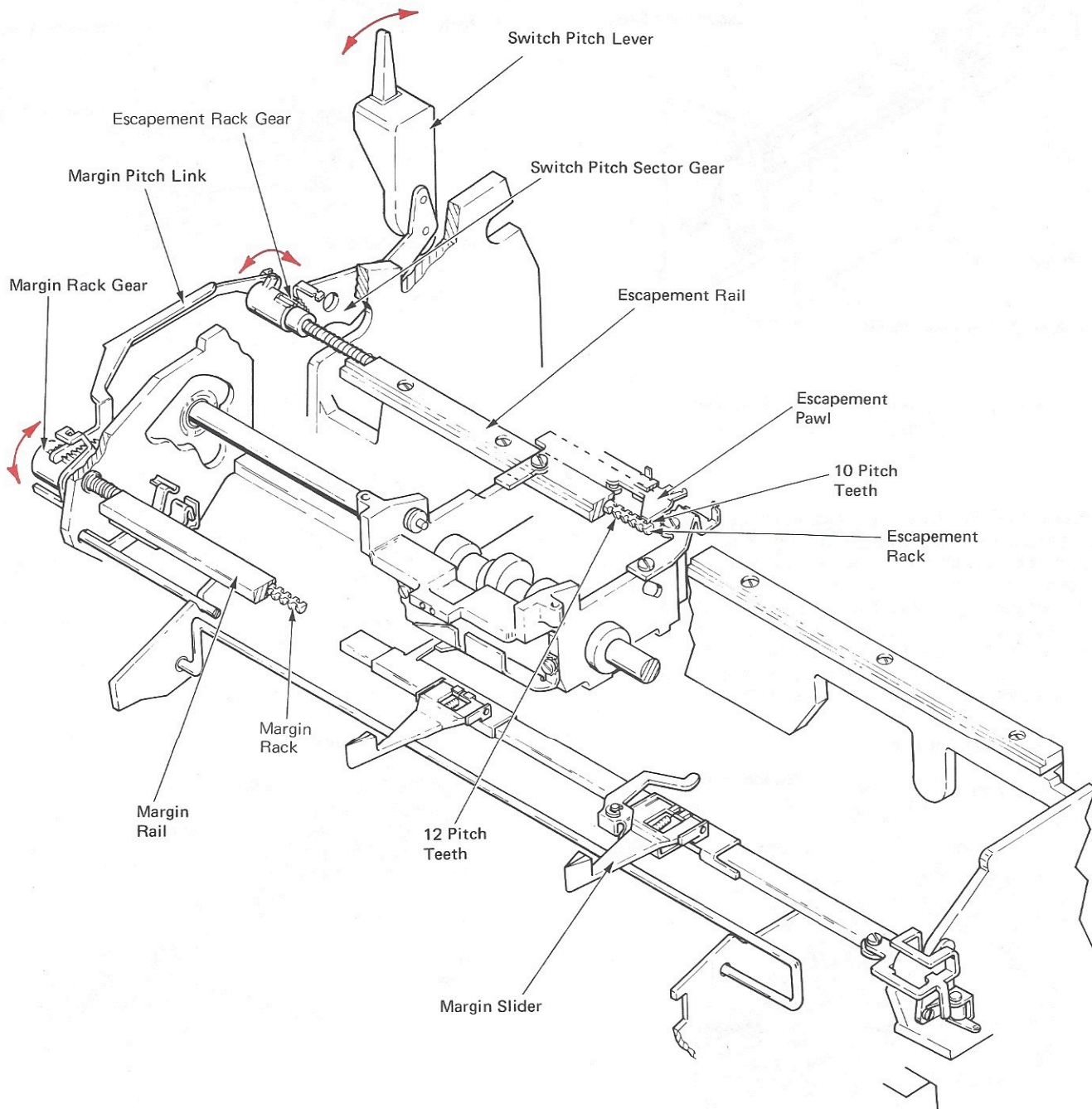


Figure 1 – Switch Pitch

The margin rack is rotated by the margin pitch link and the margin rack gear. The teeth of the margin pitch link engage the teeth of the margin rack gear which is setscrewed to the left end of the margin rack. The rear end of the margin pitch link is mounted to the escapement rack gear. As the escapement rack gear is rotated, the margin pitch link moves front-to-rear rotating the margin rack gear (Figure 6).

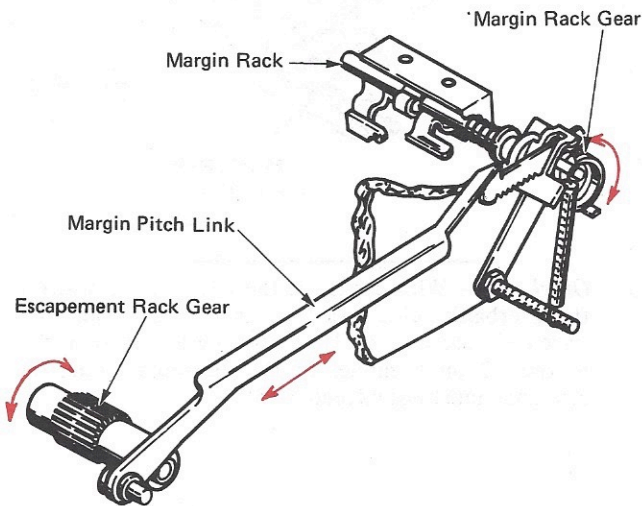


Figure 6 – Margin Pitch Link And Margin Rack Gear
(Left Rear View)

The two rest positions of the margin rack gear are controlled by two stops on the margin pitch link guide bracket. A lug on the margin rack gear is toggled and spring loaded against the stops in the same manner as the escapement rack gear (Figure 7).

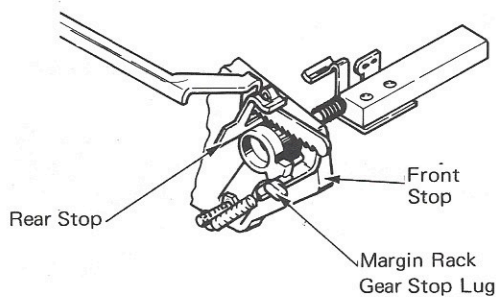
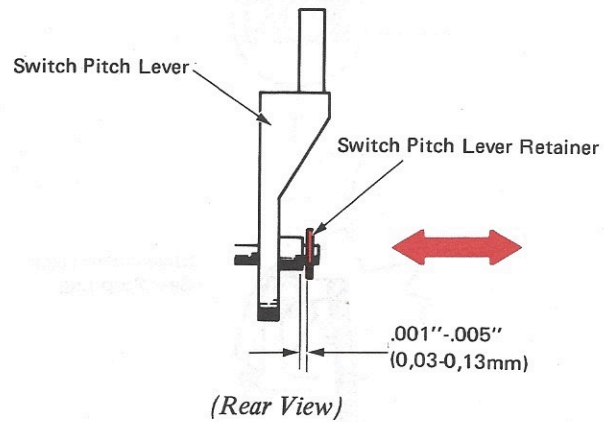


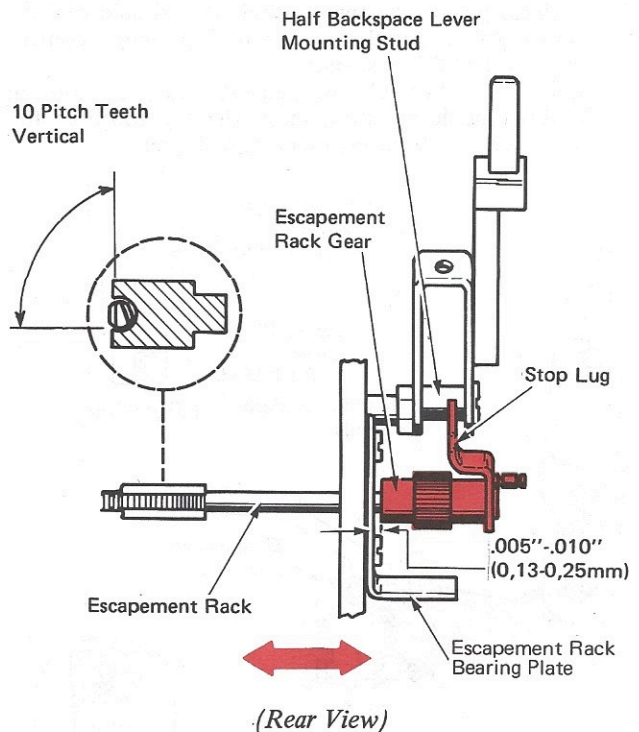
Figure 7 – Margin Rack Rotation
(Left Front View)

SWITCH PITCH ADJUSTMENTS

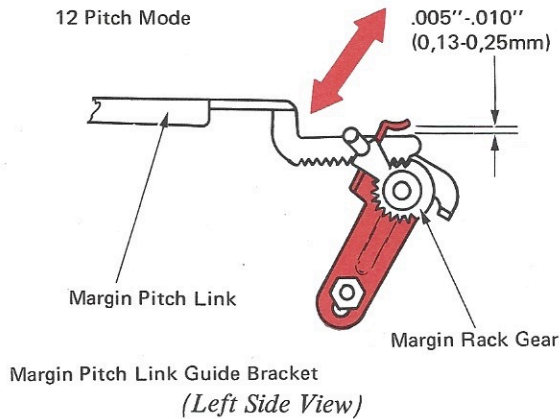
1. *Switch Pitch Lever* – Adjust the retainer for .001"-.005" end play of the switch pitch lever.



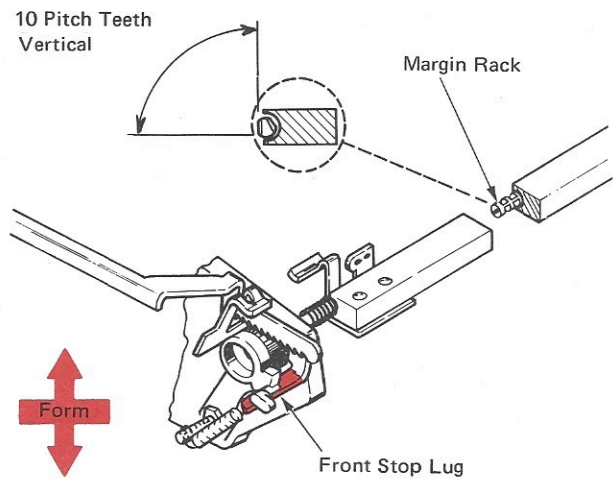
2. *Escapement Rack Gear* – With the escapement rack gear stop lug against the half backspace lever mounting stud, the 10 pitch escapement rack teeth must be vertical. A clearance of .005"-.010" must be maintained between the escapement rack gear and the escapement rack bearing plate when tightening the setscrews.



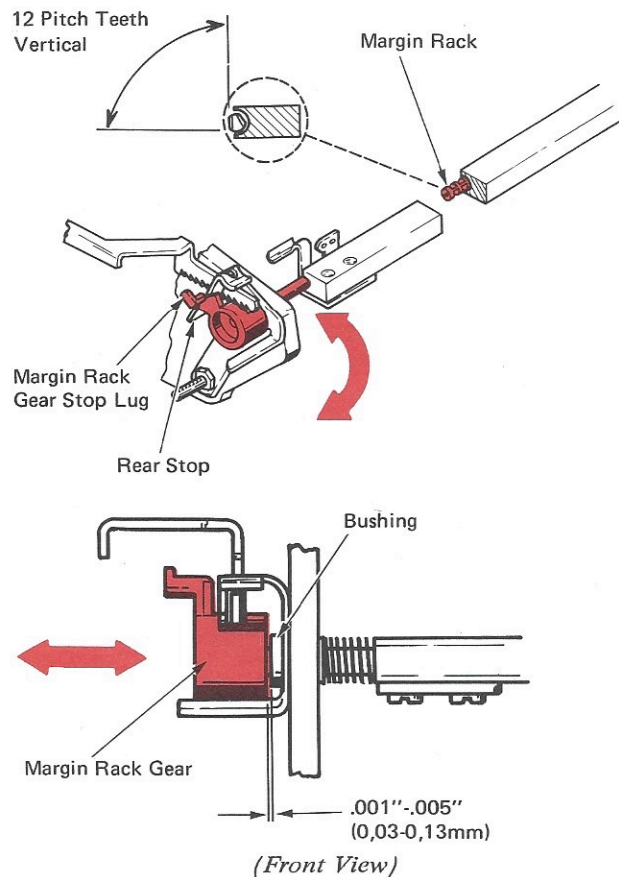
8. *Margin Pitch Link Guide Bracket* – With the machine in the 12 pitch mode, mesh the first tooth of the margin pitch link with the first tooth of the margin rack gear. Adjust the margin pitch link guide bracket up or down for .005"-.010" clearance between the guide bracket lug and the top edge of the margin pitch link. This allows the margin pitch link to have minimum backlash and not bind with the margin rack gear.



10. *Front Margin Rack Gear Stop* – Form the front margin rack stop lug so the 10 pitch margin rack teeth are vertical in the 10 pitch mode.



9. *Margin Rack Gear* – With the margin rack gear against the rear stop, rotate the margin rack until the 12 pitch teeth are vertical. Maintain .001"-.005" clearance between the margin rack gear and the bushing when tightening the setscrews.



ESCAPEMENT OPERATIONAL THEORY (SINGLE PITCH)

The purpose of the escapement mechanism is to control the single space movement of the carrier during each print cycle (Figure 1).

The carrier is under constant mainspring tension. At rest, the escapement pawl, which is mounted on the carrier, engages the escapement rack and prevents the mainspring from pulling the carrier to the right. During an escapement operation, the pawl is temporarily removed from the rack and the carrier moves to the right under mainspring tension until the pawl engages the next tooth on the escapement rack.

Power to operate the escapement mechanism is taken from a double lobed escapement cam mounted on the filter shaft just inside the right-hand power frame (Figure 1). Each time a cycle occurs, the filter shaft rotates the cam 180 degrees.

The escapement cam follower pivots on a shaft just to the rear of the escapement cam. A trip link extends from the cam follower to the trigger lever.

Each time the filter shaft turns, the escapement cam follower will pivot, pulling on the trip link, causing the trigger lever to rotate about its mounting shafts.

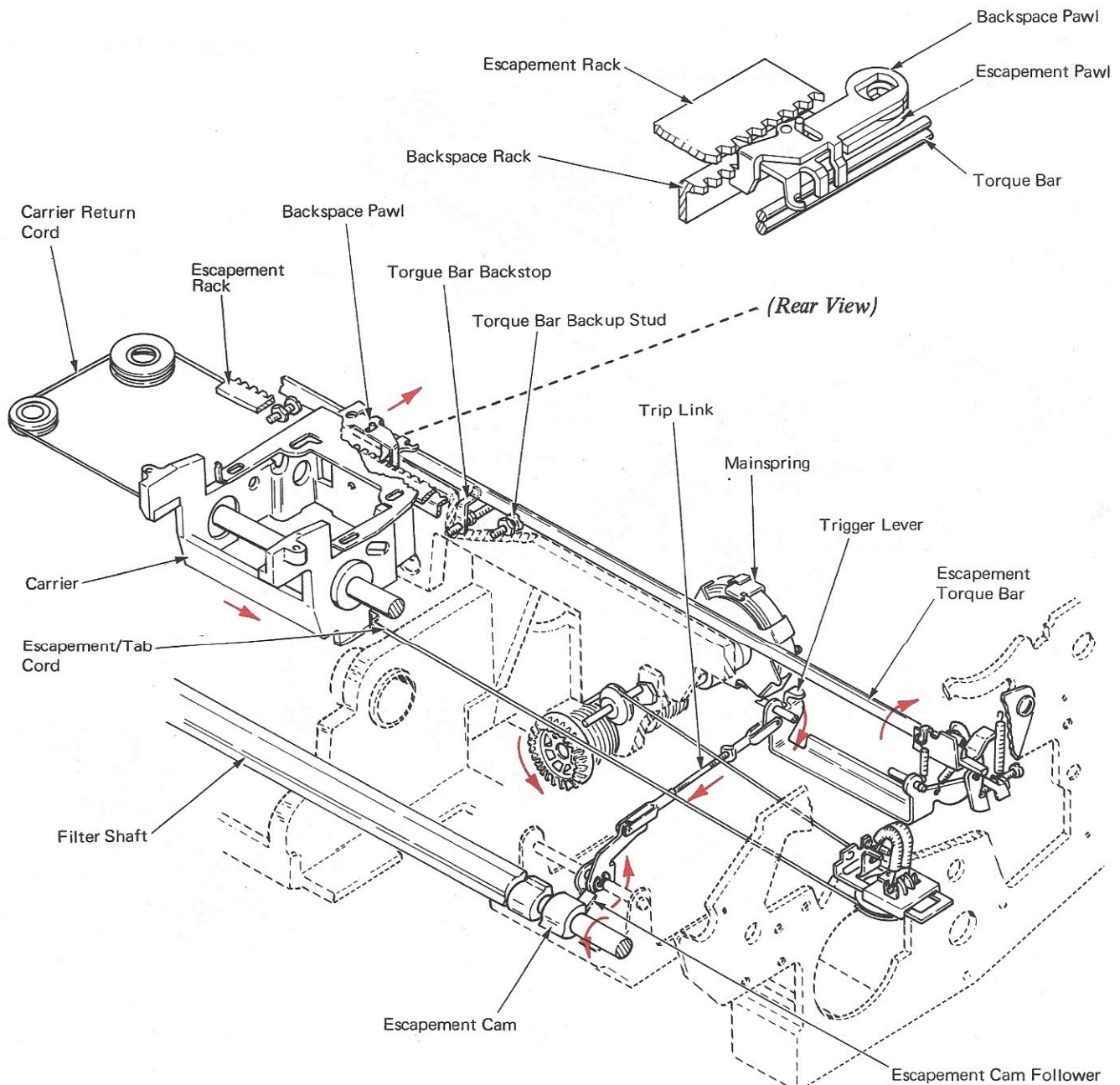


Figure 1 – Escapement Mechanism

OPERATING SEQUENCE

An escapement operation is obtained by forcing the escapement pawl to the rear, out of engagement with the rack tooth. Due to the slotted mounting hole, as soon as the pawl clears the escapement rack tooth it is snapped to the right by the pawl spring. The escapement pawl is allowed to move to the front into engagement with the next tooth. The carrier then moves to the right until it comes to rest against the escapement pawl.

Figure 3 shows the escapement and backspace pawls and their associated racks. The pivot stud is attached to the bracket mounted on the carrier.

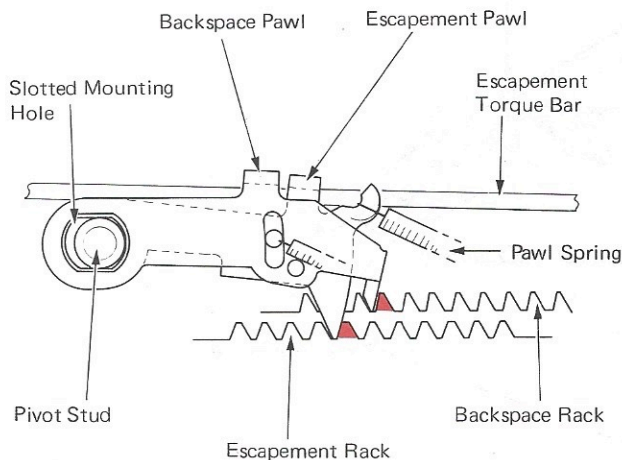


Figure 3 - Pawl At Rest (Top View)

The carrier is always being pulled to the right, and the pivot stud is against the right edge of the elongated slot in the pawls.

Figure 4 shows the torque bar operated. The pawls have been pulled free of their racks and the spring tension has pulled the pawls to the right before the carrier has started to move.

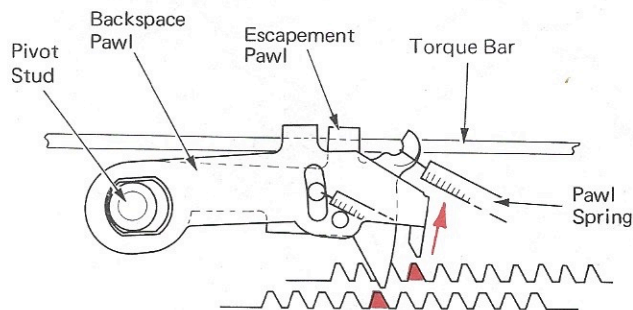


Figure 4 - Torque Bar Operated (Top View)

In Figure 5, the torque bar is returning to its rest position and the pawls are dropping into the next tooth of their racks. The carrier has not moved.

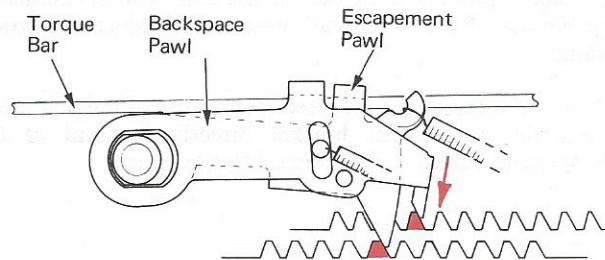


Figure 5 - Pawls Returning To Rest (Top View)

In Figure 6, the carrier has moved to the right and the pawls have stopped the pivot stud, and again the carrier is at rest after spacing once.

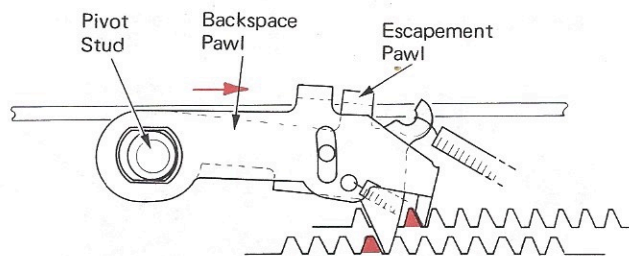


Figure 6 - End Of Operation (Top View)

NOTE: The carrier and escapement pawl must be moved to the left for a backspace operation. Because the backspace pawl is mounted to the escapement bracket, movement of the backspace pawl to the left forces the carrier and escapement pawl to the left. The backspace pawl is mounted just above the escapement pawl, but its tooth extends below the escapement pawl and is held engaged with the backspace rack by a small extension spring.

The backspace rack is mounted to the rear of the power frame by shouldered screws through elongated holes in the rack. This mounting arrangement allows lateral movement of the rack. Movement of the rack towards the left forces the backspace pawl to the left to cause a backspace operation.

The backspace operation is pointed out here due to its close association with the escapement mechanism. The backspace pawl is engaged with the rack when in the rest position. This means that both the backspace and escapement pawls must be removed from their racks in order for the carrier to move to the right.

TRIGGER KNOCKOFF

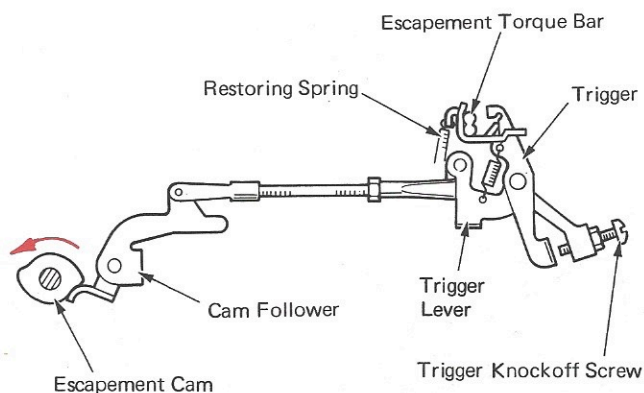
Rotation of the escapement torque bar is instantaneous and supplies just enough motion to remove the pawls from their racks. The torque bar is immediately rotated back to the rest position by a restoring spring located at the right-hand end. This allows the pawls to re-enter their racks to limit the carrier movement to one space (Figure 8).

There is a timing consideration in this type of escapement. The torque bar must return to rest before the carrier has moved enough to skip a tooth on the racks.

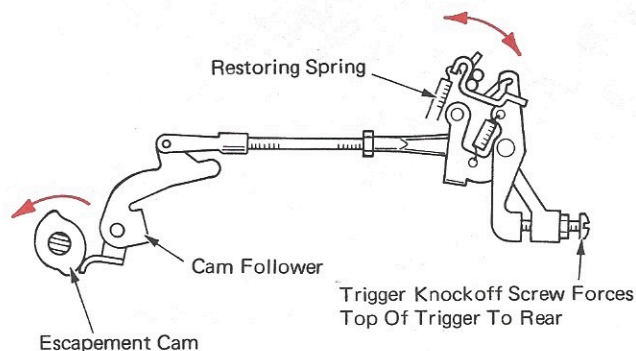
The trigger lever is operated by motion transmitted from the escapement cam, therefore, it can only restore as fast as the cam can rotate from the high point to the low point. To prevent the escapement pawl from skipping, the torque bar must be allowed to restore more quickly.

An adjustable knockoff screw causes the trigger to cam off of the torque bar lug just after the pawls have been removed from the rack. The torque bar can then restore without waiting for restoration of the trigger and the trigger lever.

Level 1 machines are equipped with an adjustable knockoff eccentric stud (Figure 9). The stud serves the same purpose as the trigger knockoff screw and will be covered further in the escapement adjustment summary.

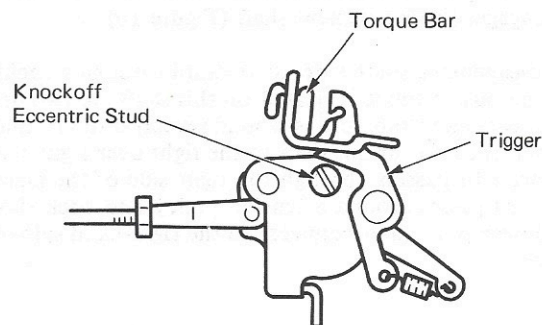


(Rest Position—Right Side View)

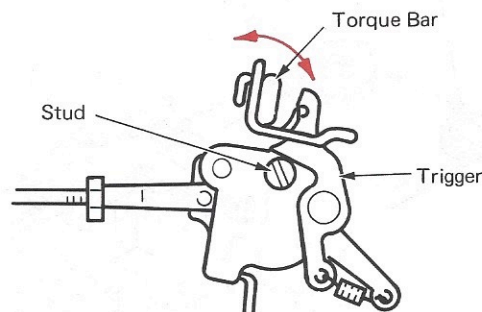


(Active Position—Right Side View)

Figure 8 – Trigger Knockoff



(Level 1 Rest Position – Right Side View)



(Level 1 Active Position – Right Side View)

Figure 9 – Trigger Knockoff (Level 1)

ESCAPEMENT OPERATIONAL THEORY (DUAL PITCH)

In the dual pitch escapement mechanism, the vertical position of the escapement pawl is critical. The pawl must be centered in the escapement rack within the opening in the escapement rail. An escapement pawl guide bracket is mounted above the escapement pawl. The escapement pawl guide lug extends down from the bracket and is formed under the escapement pawl to control its vertical movement. The escapement pawl vertical position is controlled by the vertical position of the carrier, which is adjustable. This is accomplished by a diagonal elongated mounting slot in the rear carrier shoe. As the carrier shoe is adjusted left or right, the rear of the carrier is raised or lowered (Figure 1).

Dual pitch escapement functions in the same manner as single pitch escapement. The only differences are the escapement rack (covered in the Switch Pitch Section), the escapement pawl and its mounting, and some adjustments.

Dual pitch machines use a steel cable in place of the nylon carrier return cord. Early level dual pitch machines use a steel cable for both the carrier return cord and the escapement cord.

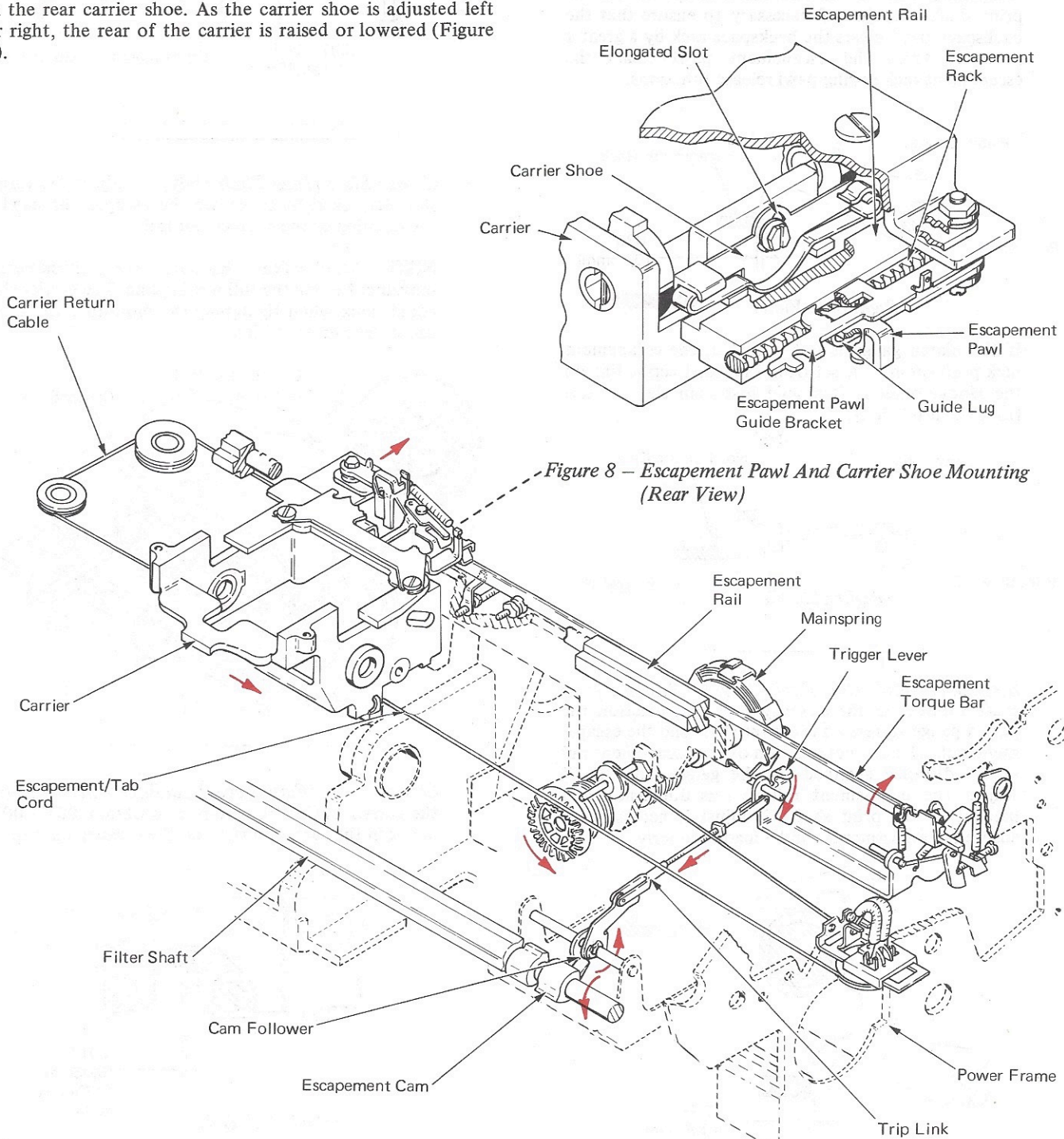
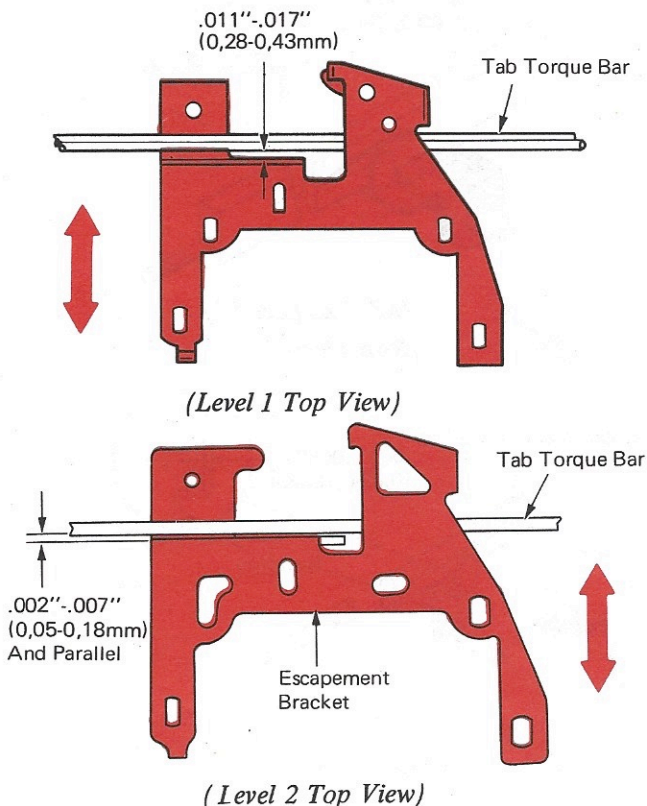


Figure 1 - Escapement Mechanism

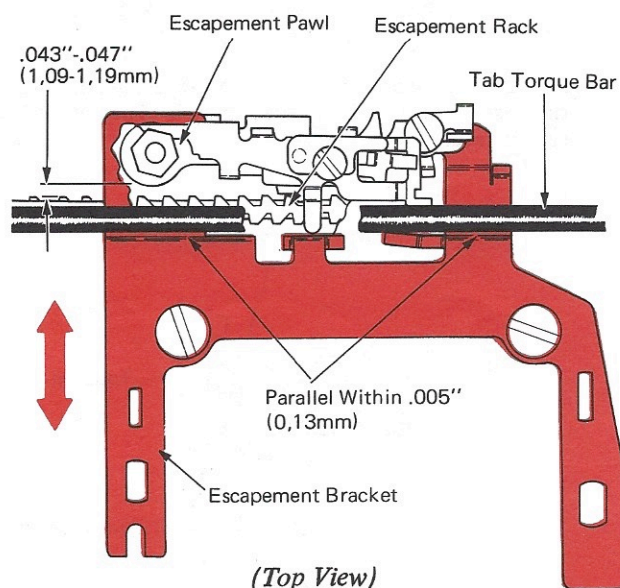
Figure 8 - Escapement Pawl and Carrier Shoe Mounting (Rear View)

6. *Escapement Bracket (Single Pitch)* – Position the escapement bracket to parallel the tab torque bar with .011”-.017” clearance. Be sure this clearance is not observed at the boss on the escapement bracket.

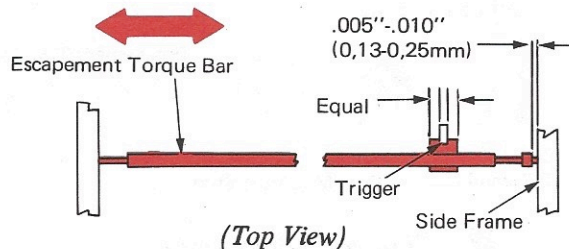
NOTE: This adjustment affects the tab adjustments.



Escapement Bracket (Dual Pitch) – Position the escapement bracket front-to-rear so the front left side of the escapement pawl clears an escapement rack tooth by .043”-.047”. The bracket must be parallel to the tab torque bar within .005”.

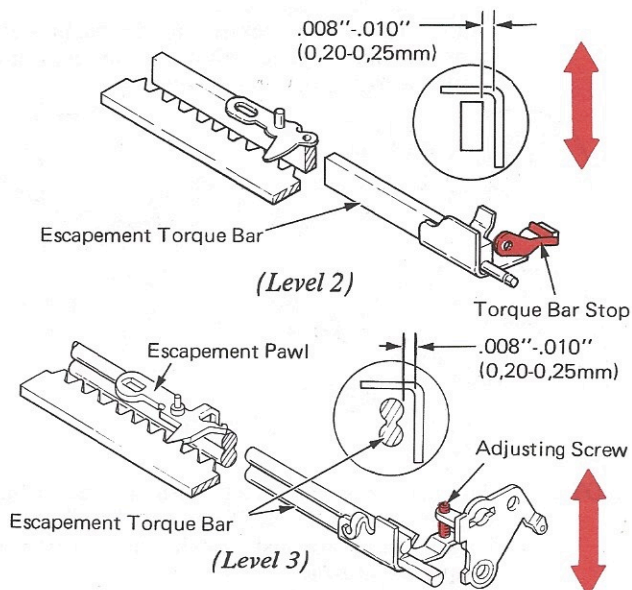
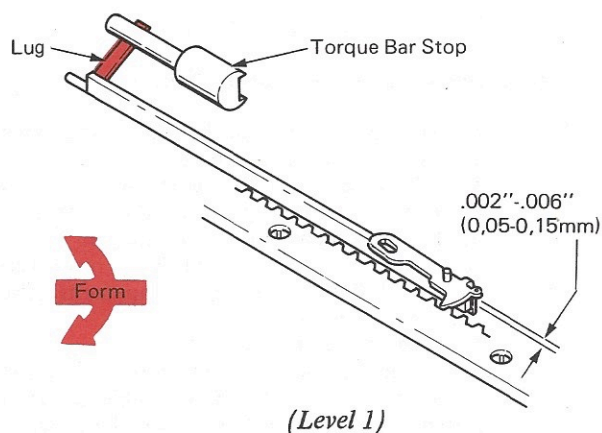


7. *Escapement Torque Bar (Level 1, Single Pitch)* – Adjust the escapement torque bar .005”-.010” end play with the escapement trigger centered on the escapement bar lug.



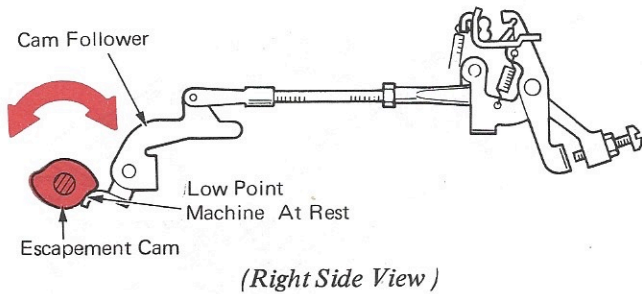
8. *Escapement Torque Bar Stop* – Adjust the escapement torque bar stop to obtain .008”-.010” clearance between the rear of the torque bar and the lug on the escapement pawl with all parts at rest.

Machines equipped with a formable lug on the left-hand end of the escapement torque bar should be adjusted for .002”-.006” clearance between the rear of the torque bar and the lug on the escapement pawl with all parts at rest.



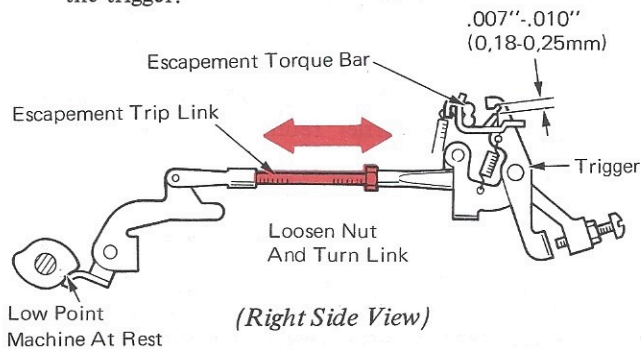
13. **Escapement Cam** – With the machine at rest, adjust the cam radially on the filter shaft so the cam follower roller is resting at the start of the low dwell.

On machines equipped with the old-style spacebar lockout mechanism, the lockout cam adjustment must be checked each time the escapement cam adjustment is changed. Advancing or retarding the escapement cam, could allow the lockout cam to disable the spacebar mechanism.



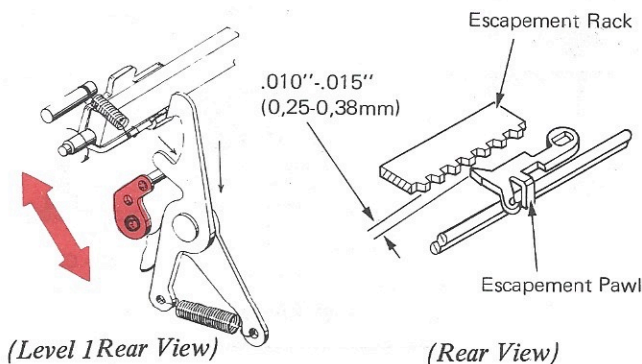
NOTE: Escapement should occur just after print.

14. **Escapement Trip Link** – With the machine latched at rest, adjust the escapement trip link to obtain .007"-.010" clearance between the hook on the trigger and the extension on the escapement torque bar. Be sure the trigger lever upstop is not restricting the trigger.



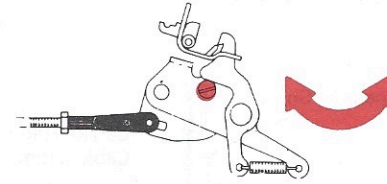
15. **Trigger Knockoff** – Adjust so the escapement trigger will cam off the torque bar lug when the escapement pawl clears the rack by .010"-.015."

Level 1 – Adjust trigger knockoff stop to obtain .010"-.015" clearance.



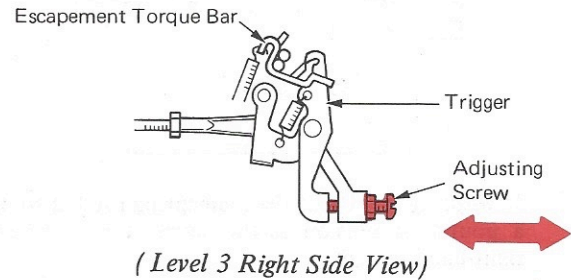
(Level 1 Rear View)

Level 2 – Adjust the eccentric to obtain .010"-.015" clearance.



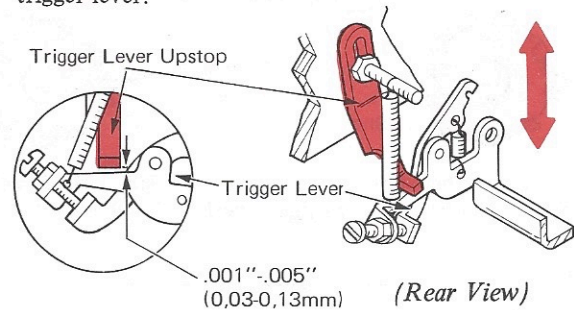
(Level 2 Right Side View)

Level 3 – Adjust the knockoff adjusting screw to obtain .010"-.015" clearance.

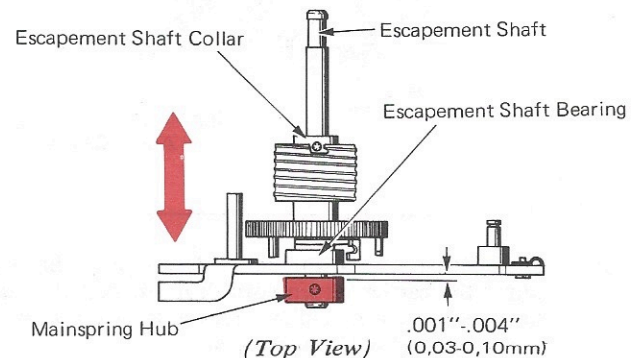


(Level 3 Right Side View)

16. **Trigger Lever Upstop** – With all parts at rest, adjust the trigger lever upstop vertically to obtain .001"-.005" clearance between the upstop and the trigger lever.



17. **Mainspring Hub (Dual Pitch Only)** – Adjust the mainspring hub for .001"-.004" end play of the escapement shaft in the rear escapement bearing. This adjustment should be made with the escapement shaft collar loose.



(Top View)

The operational control mechanism contains all of the parts necessary to initiate the spacebar, backspace, carrier return and index operations.

The operational theory for each of the four operations outlined above is covered in detail in their respective sections of this manual. The operational theory and adjustments in this section will apply to all of the operational control mechanisms. The operational control mechanism consists primarily of four interposers and an operational cam assembly (Figure 1). Each interposer performs the same basic function – to condition the

machine components so that only the desired operation will take place and to release one of the two cams so that power will be supplied to that mechanism.

The two operational cams are located on the right side of the operational shaft just inside the power frame. The left-hand cam is a double lobed cam which turns 180 degrees during each cycle. Its purpose is to power the spacebar and backspace mechanisms. The right-hand cam is a single lobed cam which rotates 360 degrees during each cycle. It powers the carrier return and index mechanisms.

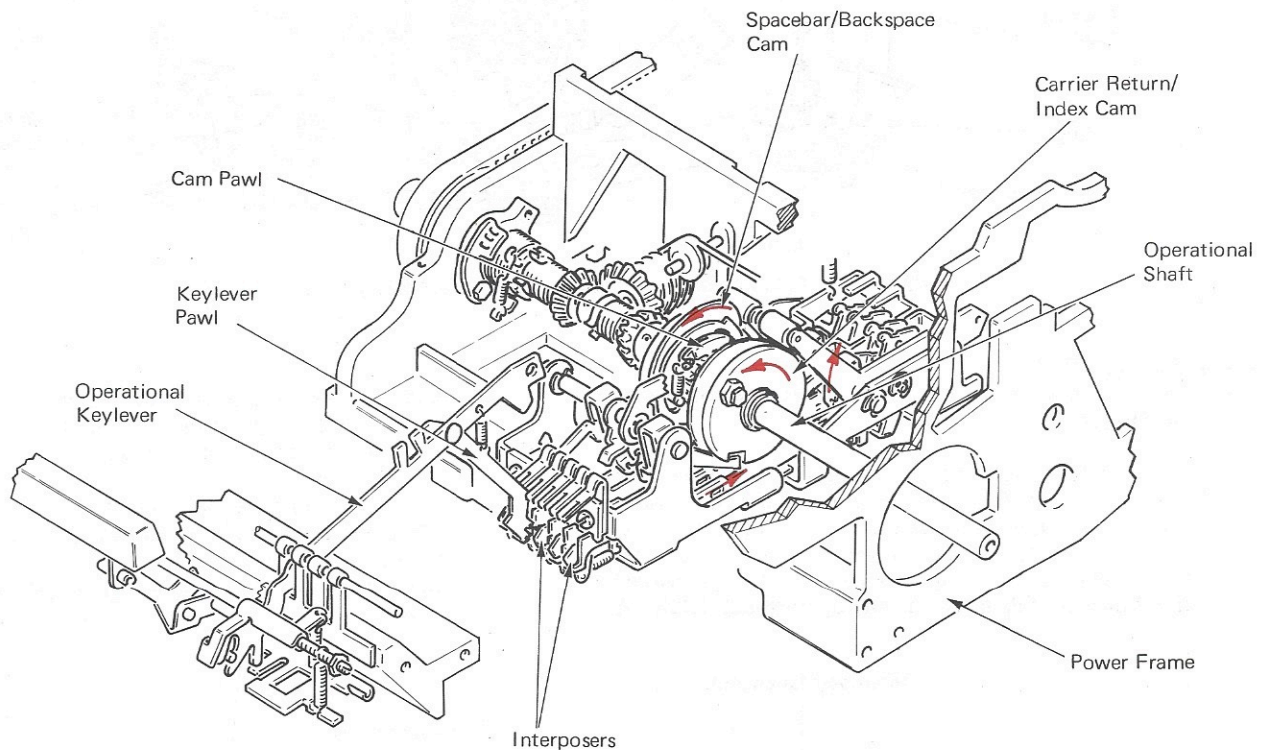


Figure 1 – Operational Control Mechanism

CHECK RING

As the operational cam completes its rotation, the cam wheel contacts the clutch release arm, which pivots the cam pawl out of the operational ratchet (Figure 4). Continued rotation of the cam allows the check pawl to engage a notch in the check ring which is mounted on the opposite side of the cam (Figure 5). The check pawl holds the cam in its rest position, ensuring that the cam pawl does not reengage the operational ratchet until the next operation.

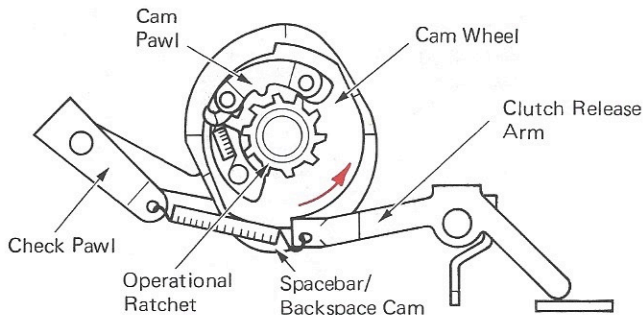


Figure 4 – Cam Wheel (Right Side View)

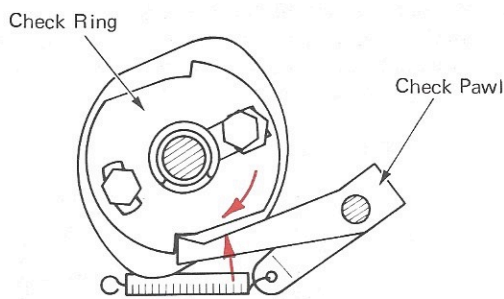
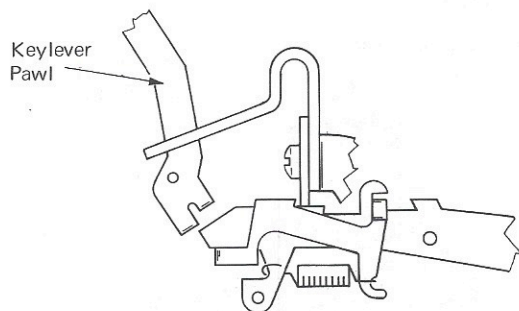


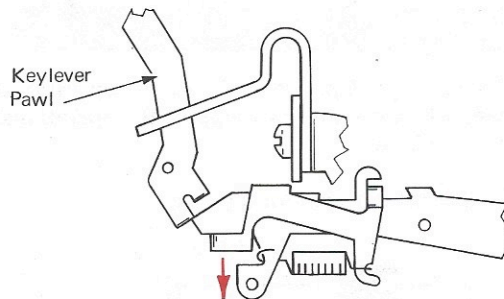
Figure 5 – Check Ring (Left Side View)

REPEAT OPERATION

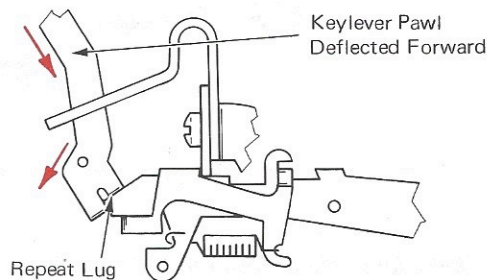
Repeat operation of an operational mechanism can be accomplished by preventing the interposer from relatching against the interposer latch plate (Figure 6). A second lug, called the repeat lug, on the keylever pawl is used to prevent the relatching of the interposer when a keylever is depressed in the repeat zone. In the case of carrier return, the repeat lug on the keylever pawl is formed to the right above the index interposer. Depression of the carrier return keylever into the repeat zone causes the index interposer to be released, resulting in additional linespacing.



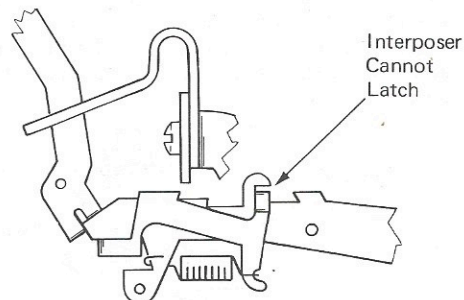
Parts At Rest



Release Point Of Single Operation



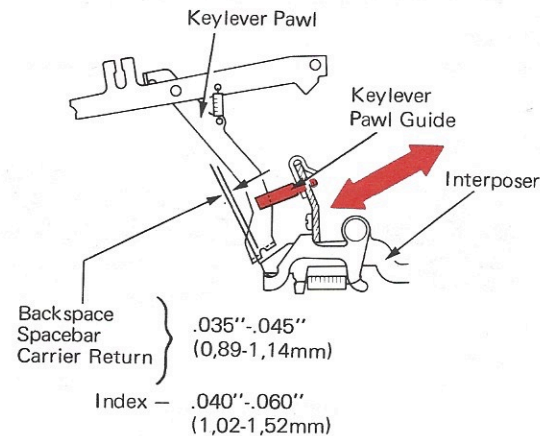
End Of Single Operation



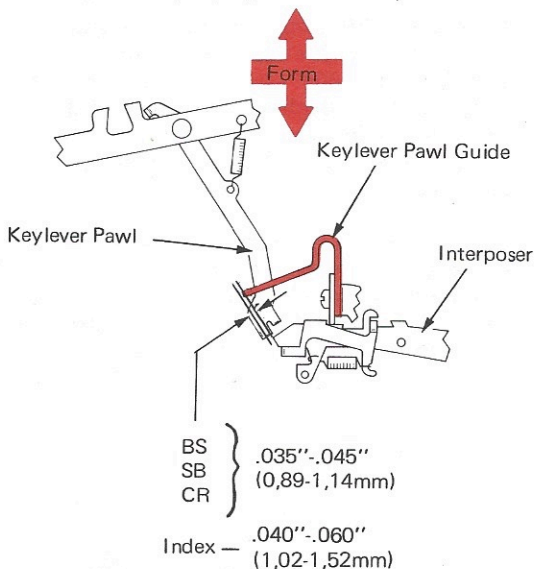
Repeat Operation

Figure 6 – Keylever Pawl Operation
(Right Side View)

6. **Keylever Pawl Overlap** – Adjust each keylever pawl guide so the keylever pawls overlap their respective interposers by .035"-.045" with both parts at rest. The index keylever pawl guide should be adjusted for .040"-.060" overlap. This overlap ensures proper repeat/nonrepeat operation.



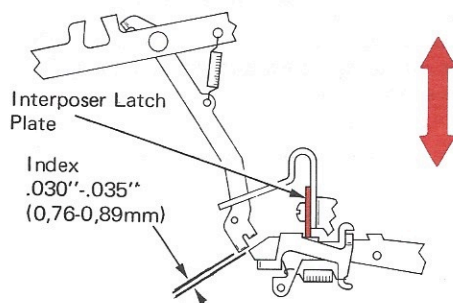
(Level 1) (Right Side View)



(Level 2) (Right Side View)

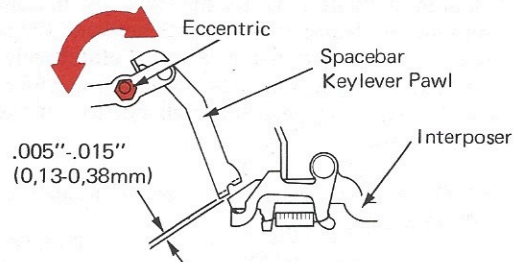
7. Keylever Pawl To Interposer Clearance –

Level 1 & 2 – Adjust the interposer latch plate for .030"-.035" between the index keylever pawl and its interposer.



(Level 2 – Right Side View)

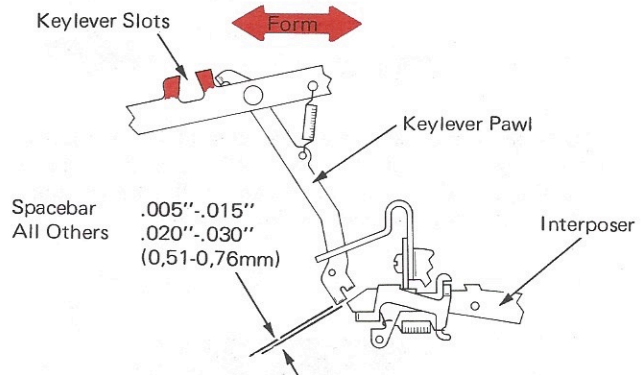
Level 1 – Adjust the spacebar keylever with the eccentric for a clearance of .005"-.015" between the keylever pawl and the interposer.



(Level 1 – Right Side View)

Level 2 – Adjust the spacebar keylever adjusting slot for .005"-.015" clearance between the keylever pawl and the spacebar interposer.

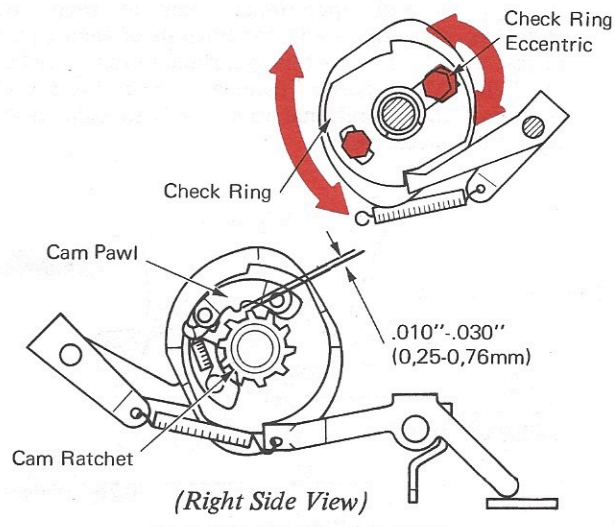
Level 1 & 2 – Adjust the keylever slots for a clearance of .020"-.030" between the backspace and carrier return keylever pawls and their interposers.



(Level 1 & 2 – Right Side View)

8. **Operational Cam Check Ring** – Adjust the operational cam check ring eccentric so that .010"-.030" exists between the tip of the cam pawl and the teeth of the operational cam ratchet with the cam latched in the rest position.

NOTE: Both the check ring mounting studs must be loosened before making this adjustment.



SPACEBAR OPERATIONAL THEORY

The purpose of the spacebar mechanism is to provide a means of moving the carrier to the right one space at a time without printing. The spacebar is mounted at the front of the keyboard on a pivot shaft (Figure 1). Depression of the spacebar causes the pivot shaft to rotate and in turn rotates

the spacebar keylever. As the spacebar is depressed, a lower lug of the keylever pawl contacts the operational interposer.

When the operational interposer is released, it releases the spacebar/backspace cam and positions the spacebar latch under the rear of the cam follower. The theory of operation for the entire operational control mechanism is covered in that section of this manual.

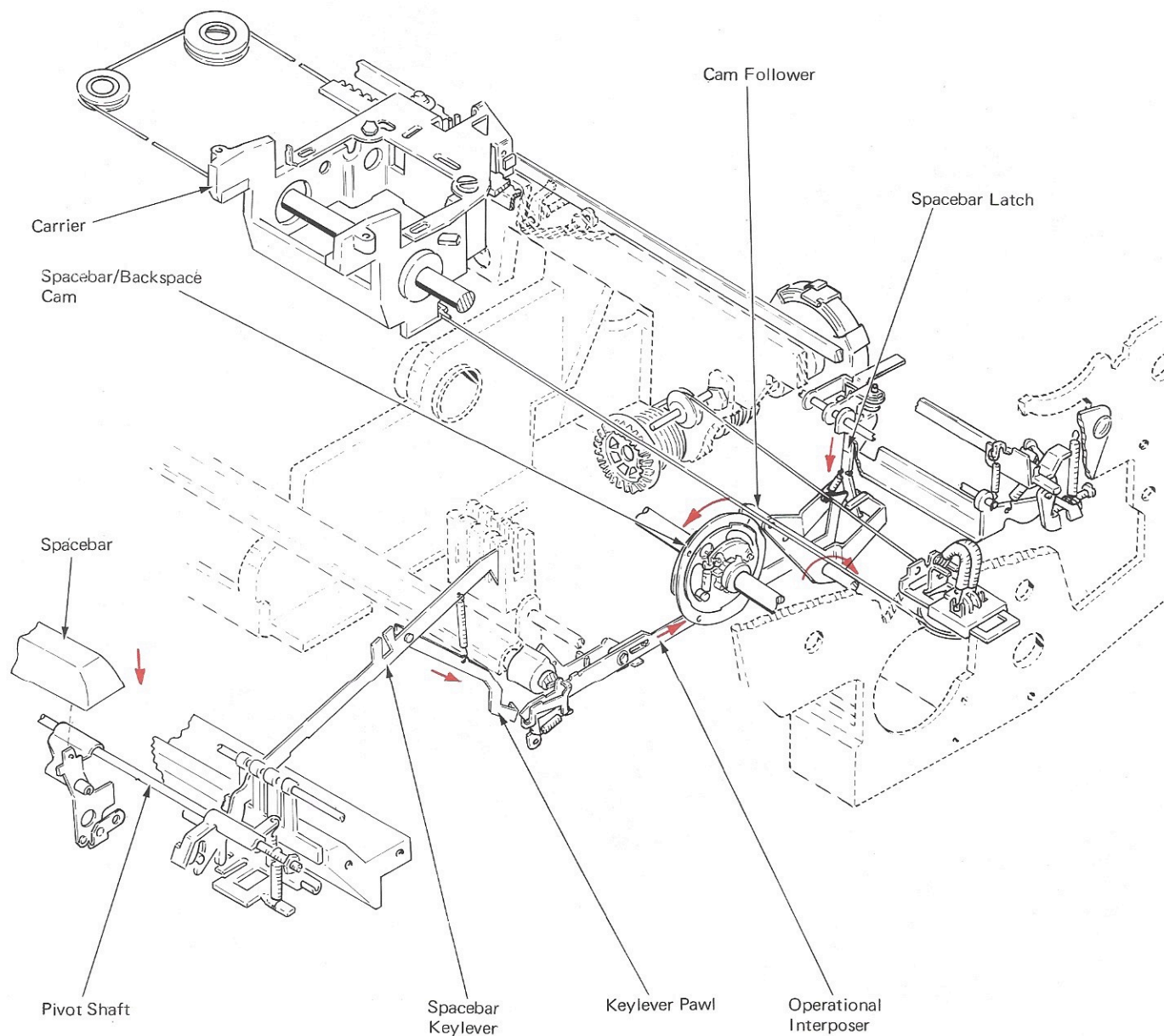


Figure 1 – Spacebar Mechanism

PRINT-TO-SPACE INTERLOCK

Both spacebar escapement and print escapement operate by actuating the escapement trigger lever to cause an escapement operation. Because of the interrelationship of these two mechanisms, operating both of them rapidly or together causes only one space of escapement to occur. This could happen when an operator strikes the spacebar too soon after a character print operation.

To ensure the spacebar will actuate an escapement operation following a print cycle, it is necessary to place the spacebar mechanism into storage until the print cycle is completed (Figure 3).

Spacebar storage is accomplished by blocking the movement of the spacebar interposer to the rear. As the filter shaft rotates during a print operation, the interlock interposer follows the contour of the spacebar interlock cam and pivots top to the front. As the interlock interposer drops off of the high point of the cam, its rear extension moves up and blocks the movement of the spacebar interposer to the rear. This stops the spacebar operation and holds the interposer in "storage" until the print cycle is completed.

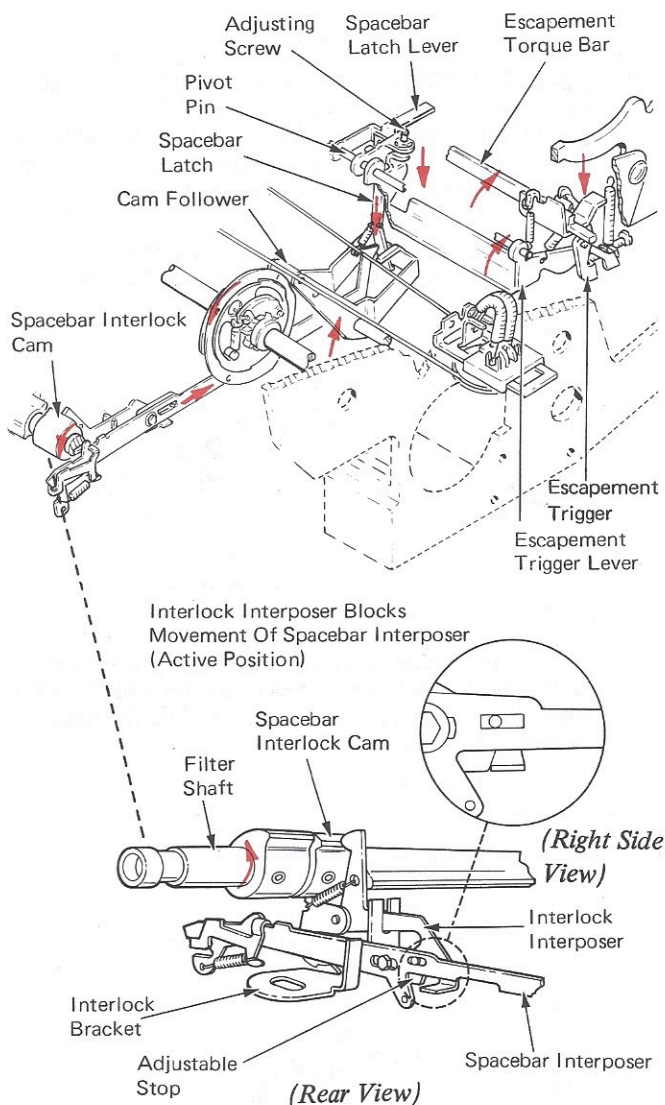


Figure 3 – Spacebar Operation & Print-To-Space Interlock

On level 1 machines, spacebar storage is accomplished differently (Figure 4). A lockout cam is spring loaded toward the right against the escapement cam. In the rest position, the lockout cam is held to the left by the lateral camming surfaces of the two cams. In this position, the spacebar interposer is free to operate without interference.

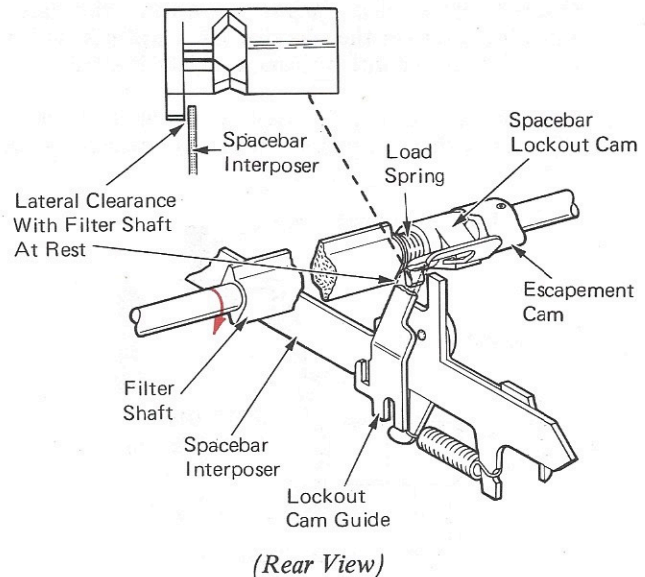


Figure 4 – Spacebar Interlock (Level 1 – At Rest)

During a character cycle, rotation of the filter shaft allows the lockout cam to move toward the right because the high points of the lateral camming surfaces are no longer in contact (Figure 5). The lockout cam is prevented from rotating with the filter shaft by a guide bracket that fits in a slot in the front of the cam. As the lockout cam slides to the right, an extension at the bottom of the cam moves into the path of a lug on the spacebar interposer. As the filter shaft approaches its rest position, the lockout cam is forced back to the left by the escapement cam. The spacebar interposer is then released and normal spacebar operations can occur.

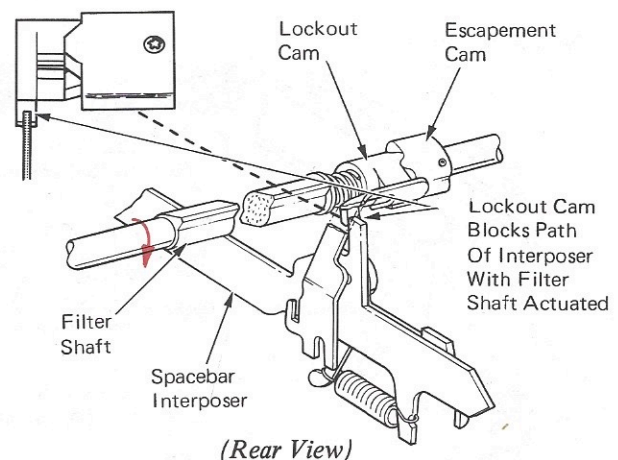
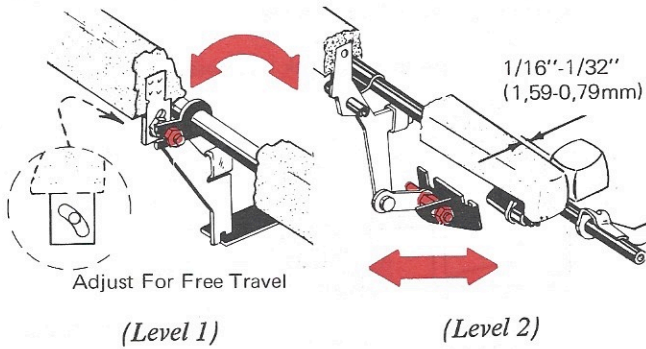


Figure 5 – Spacebar Interlock (Level 1 – Lockout Actuated)

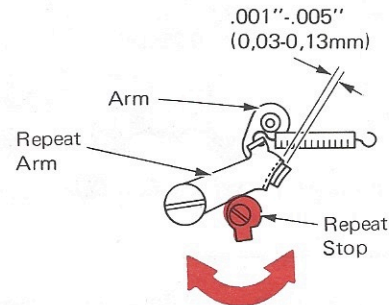
The interlocks described above are called print-to-space interlocks. This is because the print cycles supersede the spacebar cycles. This type of interlock is necessary in case the operator initiates a spacebar cycle too soon after a character print cycle.

Spacebar Guide (Levels 1 & 2) – Adjust the spacebar guide for free travel.



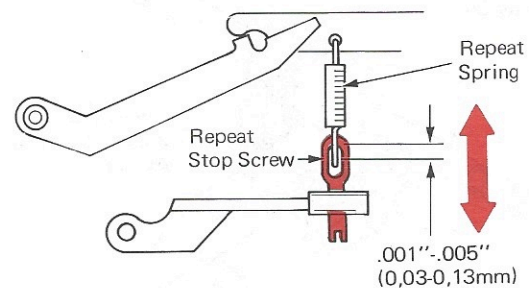
6. *Spacebar Repeat Stop* – The additional load of the repeat stop should be applied to the spacebar just after a single operation occurs. Adjust in the following manner:

Level 1 – Adjust the repeat stop rotationally for a clearance of .001\"-.005\" between the arm on the spacebar shaft and the repeat arm as a single operation just occurs.



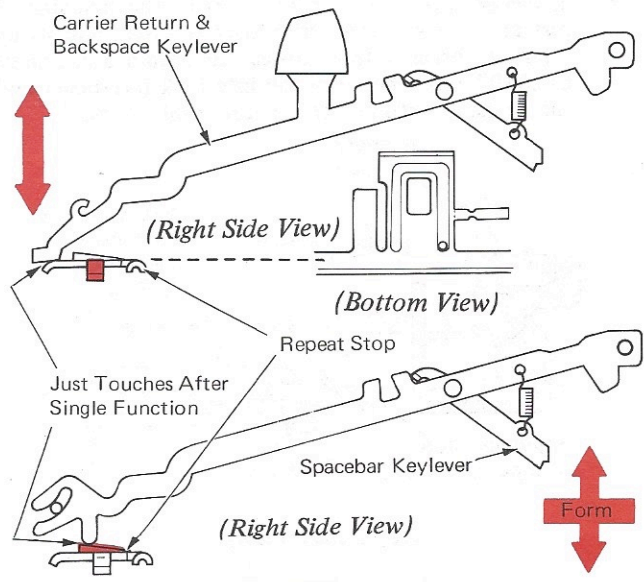
(Level 1 – Left Side View)

Level 2 – Adjust the repeat stop screw for a clearance of .001\"-.005\" between the repeat stop screw and the repeat spring as the single operation just occurs.



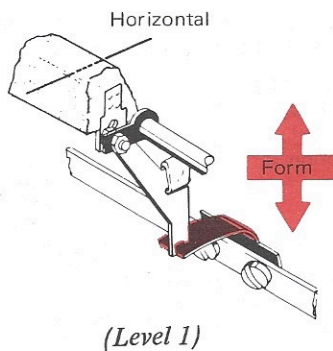
(Right Side View)

Level 3 – Form the right lug so the carrier return and backspace keylevers contact the stop just after a single operation occurs. Form the spacebar lug so the spacebar keylever contacts the stop just after a single operation occurs.



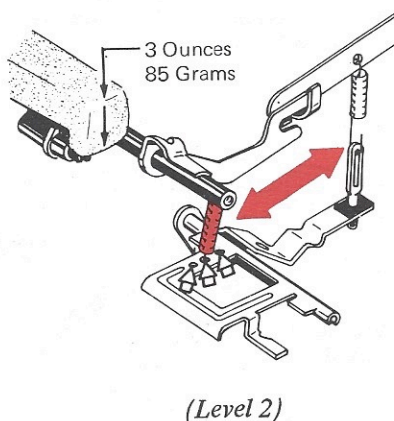
5. Spacebar Return Spring –

Level 1 – The spring should be formed up or down so that a weight of 2-1/2 ounces will just fail to trip the spacebar interposer. The medium screwdriver, which weighs 2-1/2 ounces, can be used for this check.



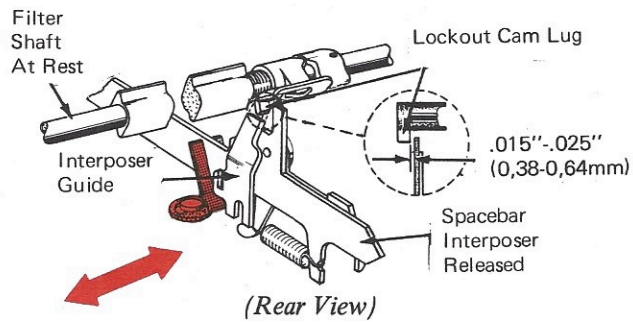
(Level 1)

Level 2 – Position the spring on one of the three lugs on the carrier return/backspace repeat bail so that the spacebar can be tripped by a three ounce load.



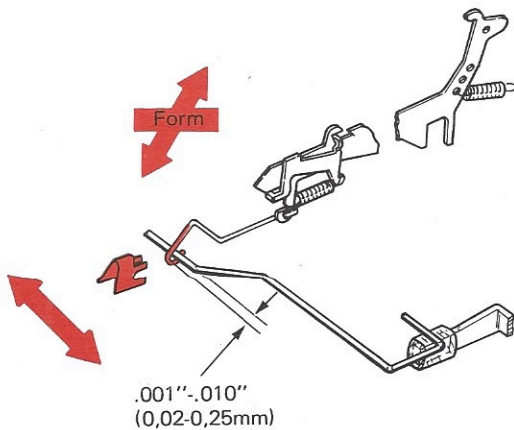
(Level 2)

13. *Spacebar Interposer Guide (Level 1)* – With the filter shaft at rest and the spacebar interposer released, adjust the interposer guide left or right to obtain .015"-.025" clearance between the interposer and the lockout cam lug.



14. *Space-To-Print Interlock* – This adjustment only applies to machines equipped with a field installed space-to-print interlock.

- With the machine tilted up, position the retaining clip so the space-to-print interlock extension is vertical.
- Form the space-to-print interlock extension to clear the character interrupter bail by .001"-.010" with all parts at rest.



CARRIER RETURN OPERATIONAL THEORY

The purpose of the carrier return mechanism is to return the carrier to the left margin (Figure 1). The index mechanism is activated during each carrier return operation to line space the paper. The carrier return and index operations leave the carrier in position for printing at the beginning of the next line.

NOTE: The index mechanism is discussed in the Paper Feed and Index Section of this manual.

During a carrier return operation, several things occur: The escapement torque bar is rotated to remove the escapement and backspace pawls from their respective racks. The carrier return spring clutch is activated to drive the carrier to the left margin. The carrier return mechanism is latched in its active state to ensure the carrier is driven to the left margin. When the carrier reaches the left margin, the mechanism is unlatched.

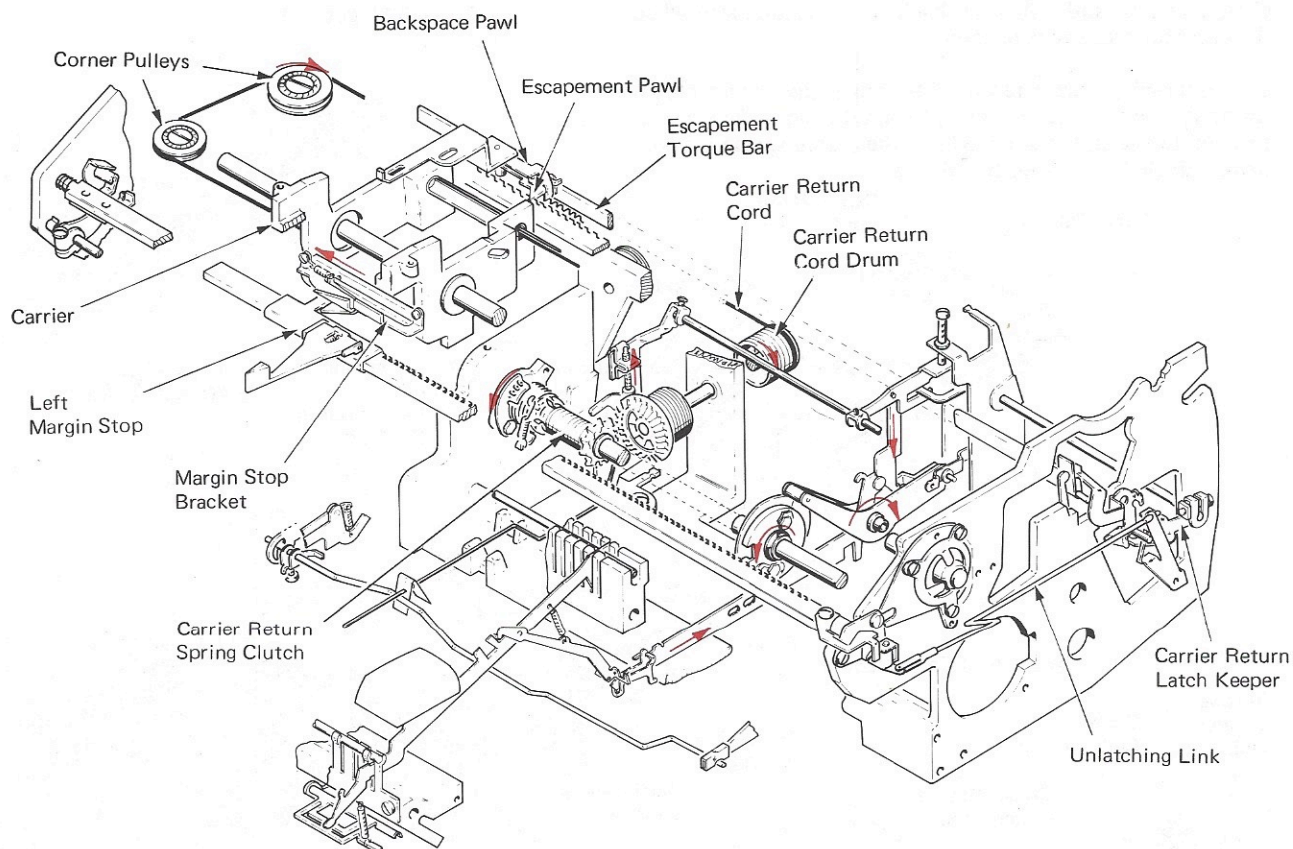


Figure 1 – Carrier Return Mechanism

CARRIER RETURN UNLATCHING

When the carrier reaches the left margin, the carrier return clutch must be unlatched and the pawls returned to their racks, ready for the next operation. This is accomplished through the line lock bracket which transfers motion from the carrier through the margin rack to unlatch the carrier return arm assembly (Figure 3).

When the carrier is away from the left margin, a compression spring, located at the left end of the margin rack, loads the rack to the right. As the carrier is returned to the left margin, the line lock bracket strikes the left margin stop, forcing the margin rack to the left. Motion is then transferred through the overbank guide, a bellcrank and an unlatching link to pull the latch keeper forward, unlatching the carrier return arm assembly. As the carrier return arm unlatches, the escapement torque bar will return to rest allowing the pawls to return to their racks and the nylon shoe will return to rest disengaging the carrier return clutch.

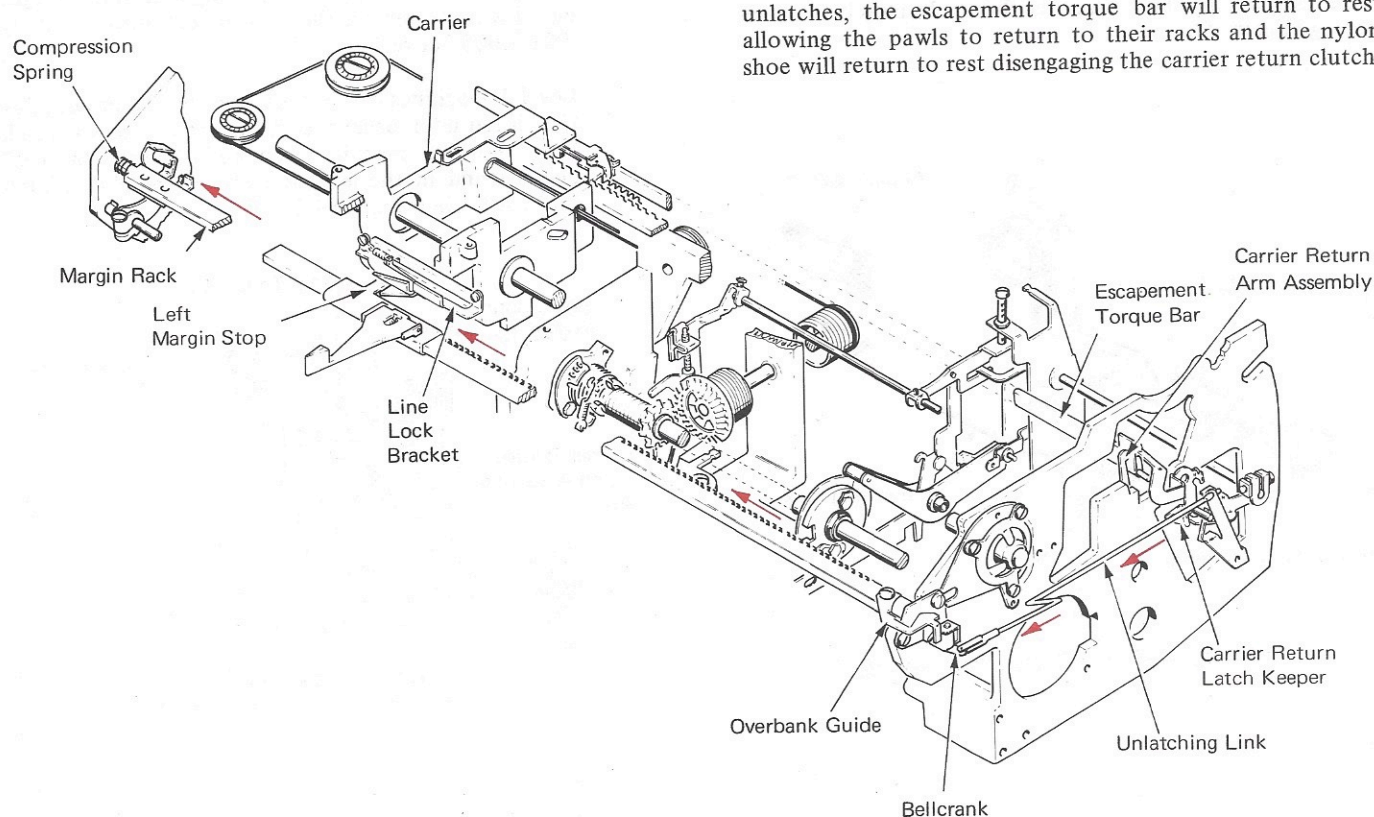


Figure 3 – Carrier Return Unlatching

TORQUE LIMITER

If the carrier is already resting at the left margin when a carrier return operation is initiated, the carrier return mechanism must be allowed to slip in order to reduce strain and prevent parts breakage. To accomplish this, rotational motion of the operational shaft is supplied to the carrier return clutch arbor through a torque limiter (Figure 4). The torque limiter is a spring clutch which imparts a controlled amount of torque to the carrier return clutch arbor.

between this loop and an eccentric stud on the torque limiter hub. The extension spring increases the force required to unwind the torque limiter spring so that no slippage occurs during normal carrier return. The torque limiter spring slips when the carrier cannot move to the left. It also slips at the beginning of a carrier return operation to allow smooth acceleration and prevent an erratic start.

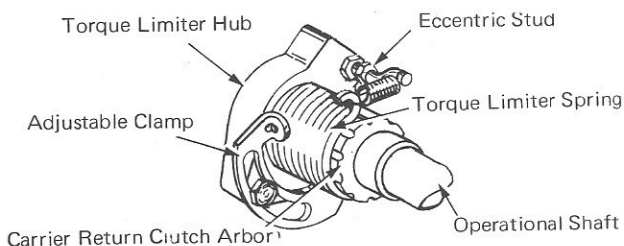
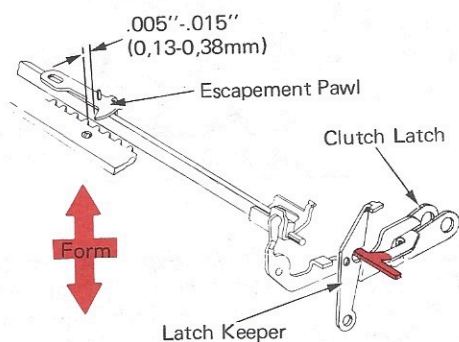


Figure 4 – Torque Limiter
(Level 1)

The torque limiter consists of the torque limiter hub, which is setscrewed to the operational shaft and the torque limiter spring. The left end of the torque limiter spring is anchored to the torque limiter hub by an adjustable clamp. The right half of the torque limiter spring fits over the large shoulder of the carrier return clutch arbor.

The operational shaft turns in the unwinding direction of the torque limiter spring. This tends to expand it and allow it to slip. The spring, however, is heavy and considerably smaller in diameter than the carrier return clutch arbor, over which it fits. The friction present between the arbor and the spring tends to drive the arbor even though it is in the unwinding direction of the spring, but insufficient driving force is obtained from this arrangement. The right end of the torque limiter spring has a loop formed to accept an extension spring. The extension spring is connected

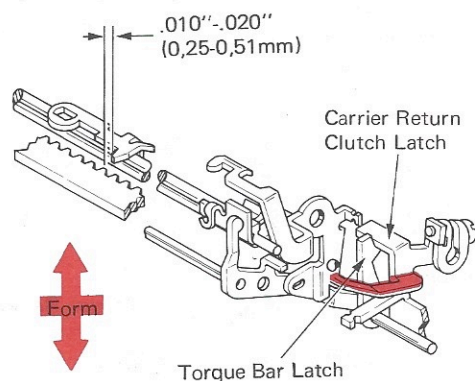
- b. **Level 2 and 3** – Form the tip of the carrier return clutch latch to obtain .005”-.015” (0,13-0,38mm) between the escapement pawl and the escapement rack during a carrier return and that the pawl will be allowed to re-enter the rack quickly at the completion of a carrier return operation.



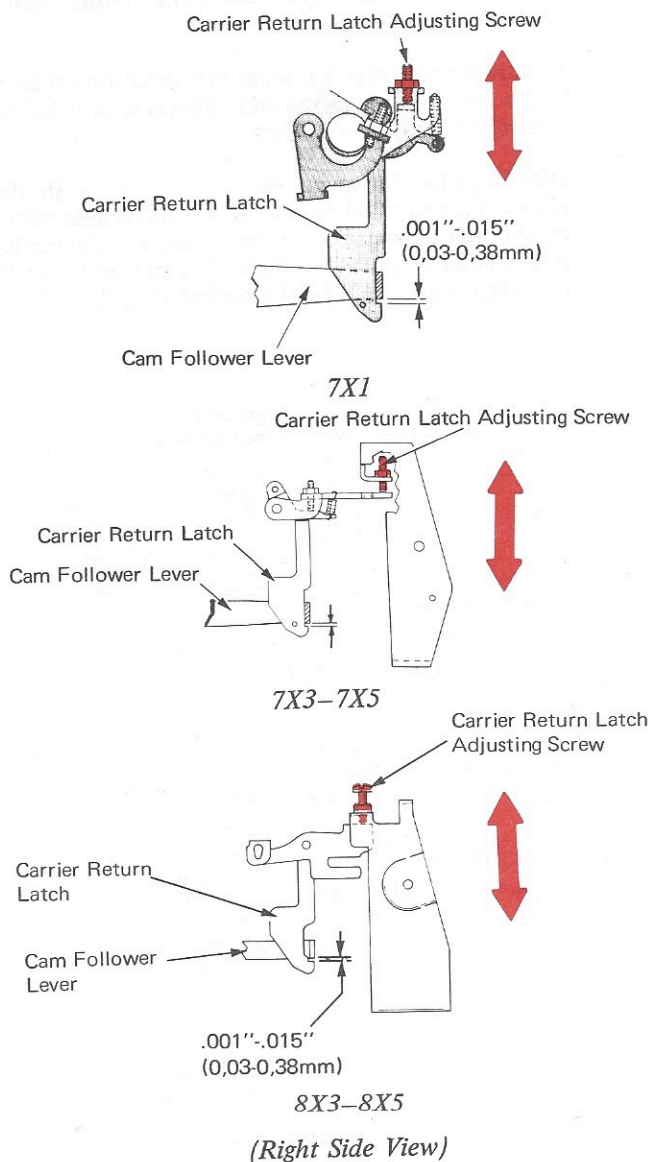
(Level 2 & 3)

- c. **Level 4** – With the carrier return latched, form the clutch latch for .010”-.020” escapement pawl clearance. Ensure that the torque bar latch is under the lug on the carrier return clutch latch.

NOTE: “Selectric” II single pitch only.



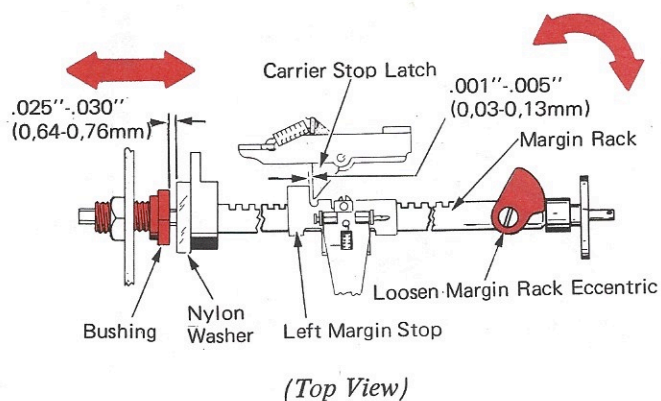
3. **Carrier Return Latch Height** – Adjust the carrier return latch adjusting screw to obtain .001”-.015” clearance between the latch and the cam follower lever. This adjustment should be made to the low side of the spec to ensure a minimum of lost motion.



7. Overbank –

Level 1 – With the carrier at the left-hand margin, adjust the margin rack eccentric to obtain .001"-.005" clearance between the left-hand margin stop and the carrier stop latch. Next, adjust the bushing at the left-hand end of the margin rack to obtain .025"-.030" between the bushing and the nylon washer.

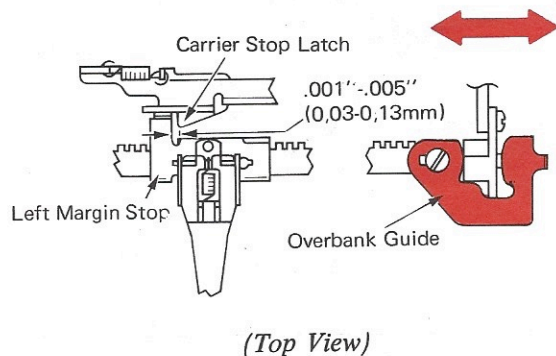
NOTE: Any change in overbank on machines equipped with this old-style margin rack assembly will directly affect the clutch unlatching adjustment.



Level 2 – With the carrier resting at the left-hand margin, adjust the overbank guide left-to-right to obtain .001"-.005" clearance between the left-hand margin stop and the carrier stop latch. The floating action of the stop latch must be removed by pulling the latch to the right with a spring hook before this clearance can be observed.

The adjustment of the overbank guide on the margin rack determines the rest position of the margin rack. This adjustment ensures that the left-hand margin stop will set accurately when the stop is moved to the right against the carrier. The adjustment of the overbank guide, plus the amount of lateral motion that the guide permits, automatically provides the carrier with the overbank required for proper escapement pawl re-entry at the completion of a carrier return operation.

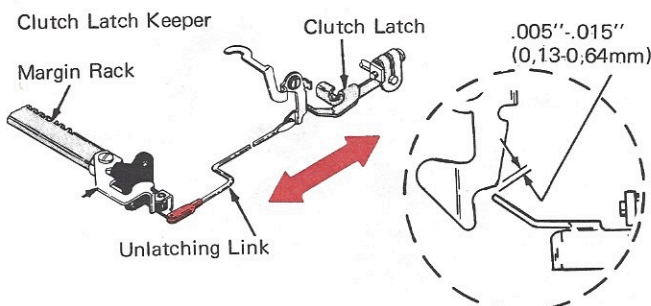
NOTE: Dual pitch machines must be checked in 12 pitch.



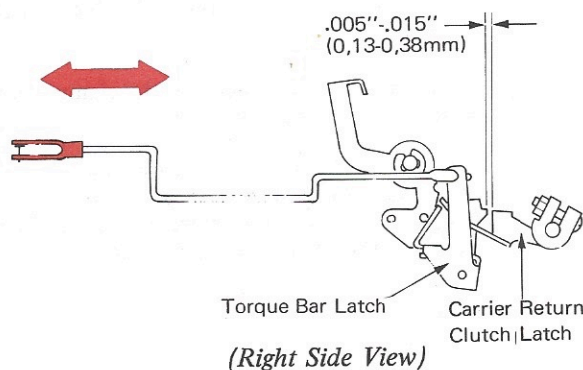
8. Clutch Unlatching –

Level 1 – With the power on, hold the clutch latch down. The carrier return latch keeper should clear the tip of the carrier return latch by .005"-.015" at the unlatching point. Lengthen or shorten the carrier return unlatching link to obtain this clearance.

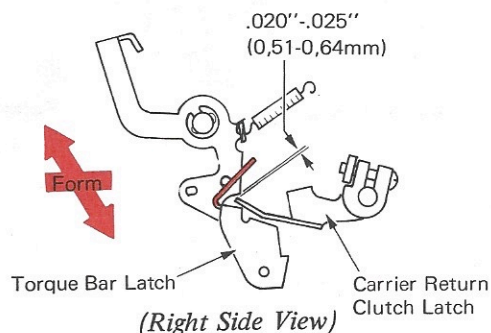
NOTE: On machines equipped with the early style margin rack, check the margin rack eccentric adjustment if the clutch fails to latch properly. The eccentric may be holding the rack too far to the left restricting the margin rack motion and reducing the amount of bite that the keeper may take on the latch.



Level 2 – With the margin rack held to the left, adjust the clutch unlatching link for .005"-.015" between the carrier return clutch latch and the torque bar latch.



9. **Torque Bar Latch** – Form the lug on the torque bar latch so the carrier return clutch latch will have at bite of .020"-.025" on the carrier return clutch latch keeper when carrier return is latched.



BACKSPACE OPERATIONAL THEORY

The purpose of the backspace mechanism is to move the carrier to the left one space at a time. When the backspace mechanism is operated, cam motion is transferred through a cam follower, latch assembly, intermediate lever, backspace rack, and backspace pawl to move the carrier to the left (Figure 1).

The complete operational theory of the operational control mechanism can be found in the operational control section of this manual.

BACKSPACE OPERATION

When the backspace cam is rotated, motion is transferred through the cam follower to operate the backspace latch.

As the backspace latch is pulled down by the cam follower, the latch assembly pivots around its mounting stud, rotating the intermediate backspace lever clockwise on its mounting stud. The front of the intermediate backspace lever moves the backspace rack to the left.

PAWL MOUNTING

The backspace pawl is mounted to the escapement bracket directly above the escapement pawl. Movement of the backspace pawl to the left also moves the carrier and the escapement pawl to the left.

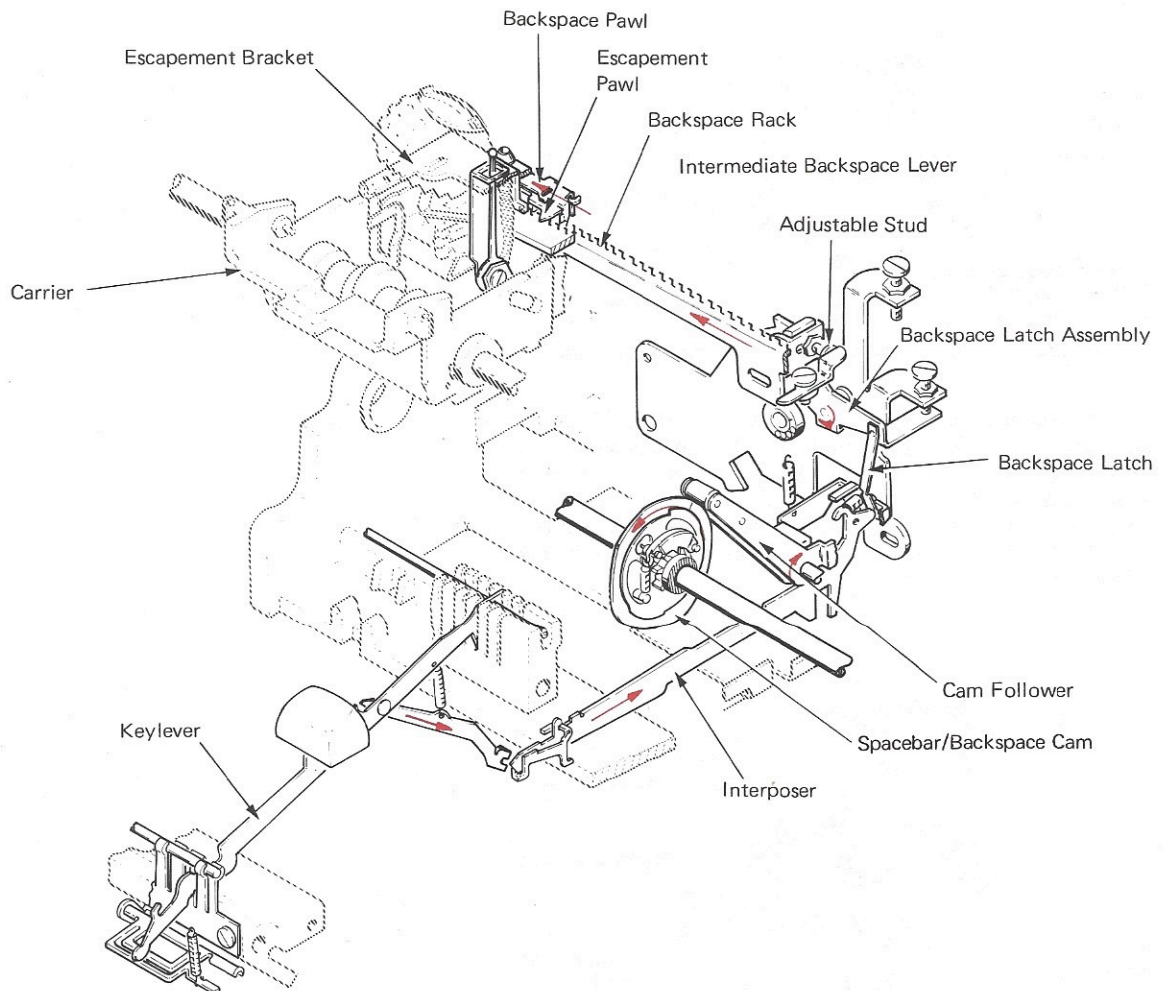
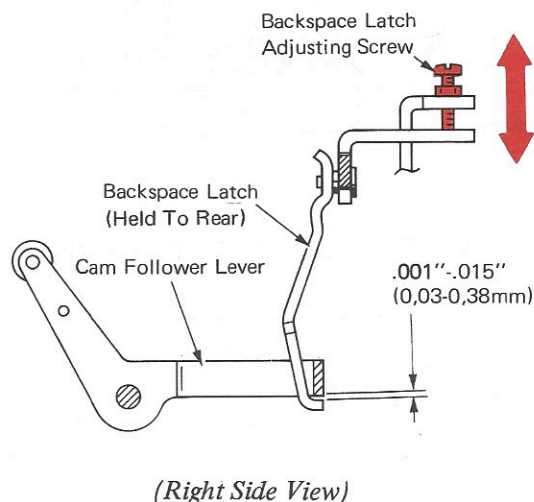


Figure 1 – Backspace Mechanism

BACKSPACE ADJUSTMENTS

NOTE: All operational control adjustments must be correct before attempting to make backspace adjustments.

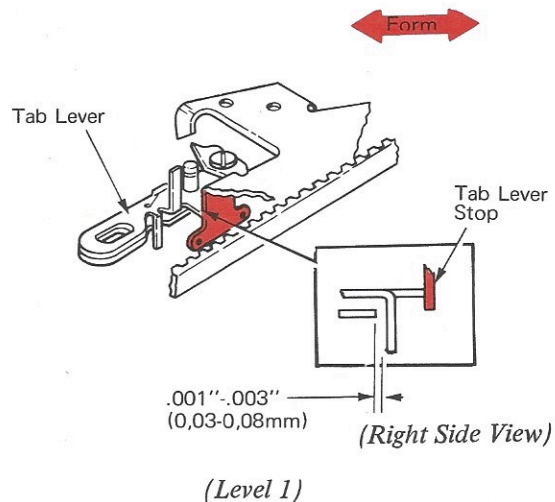
1. **Backspace Latch Height** – Adjust the backspace latch adjusting screw for .001"-.015" clearance between the latch and the cam follower lever. This adjustment should be made to the low side of the spec to ensure a minimum of lost motion.



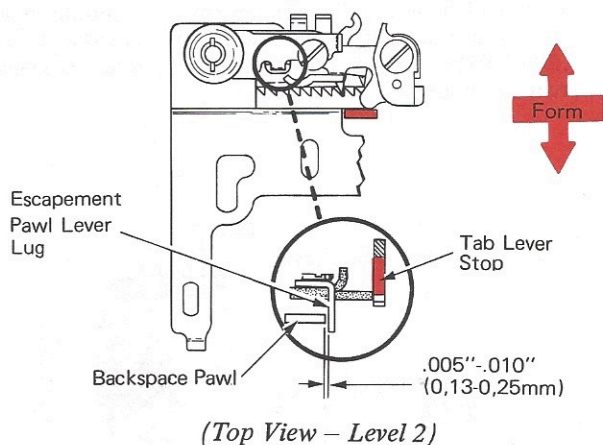
2. **Tab Lever Stop** –

Level 1 – Form the stop front and rear for a clearance of .001"-.003" between the vertical lug on the tab lever and the backspace pawl when the pawl is bottomed in its rack.

NOTE: Make sure all escapement bracket and print escapement adjustments are correct before forming this stop.



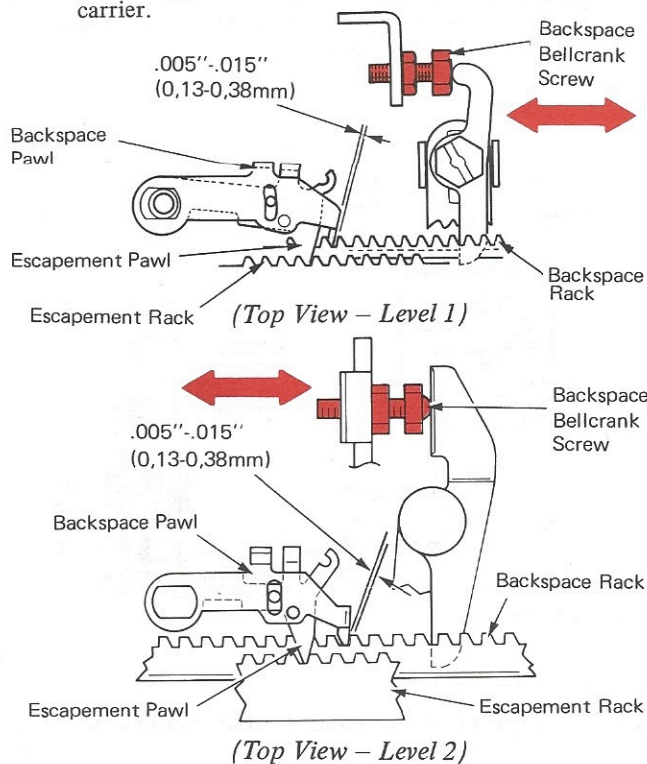
Level 2 – Form the stop front and rear for a clearance of .005"-.010" between the vertical lug on the escapement pawl lever and the backspace pawl when the pawl is bottomed in its rack.



3. **Backspace Rack** – With the machine at rest, adjust the backspace bellcrank screw in or out to obtain .005"-.015" clearance between the working surface of a rack tooth and the backspace pawl. Check at both ends of the writing line.

This adjustment minimizes lost motion and ensures that the backspace pawl will positively reset in the next rack tooth at the completion of a backspace operation.

No clearance can cause escapement problems as well as backspace problems by allowing the backspace pawl, instead of the escapement pawl, to hold the carrier.



ROTARY BACKSPACE OPERATIONAL THEORY

The rotary backspace mechanism pulls the carrier return/backspace cable to move the carrier to the left one space at a time. This mechanism functions in either the 10 or 12 pitch mode.

Because of this different method of backspacing, the carrier transport system in the "Selectric" II and Correcting "Selectric" typewriters is somewhat different than the "Selectric" Typewriter. The major difference in the transport system is the use of steel cables that are stretch resistant and stronger, in place of nylon cords. The tab/escapement cable/or cord is anchored in approximately the same manner as the "Selectric" Typewriter tab/escapement

cord. The carrier return/backspace cable is anchored at the carrier to an arm on the cable anchor bracket that is free to pivot. This arm is heavily spring loaded to the right against a stop lug. The purpose of the pivot arm and spring is to act as a shock absorber when the carrier is pulled to the left by the cable. The other end of the cable is attached to the carrier return/backspace cable drum. The carrier return/backspace cable drum and backspace ratchet are one piece and operate as a unit (Figure 1).

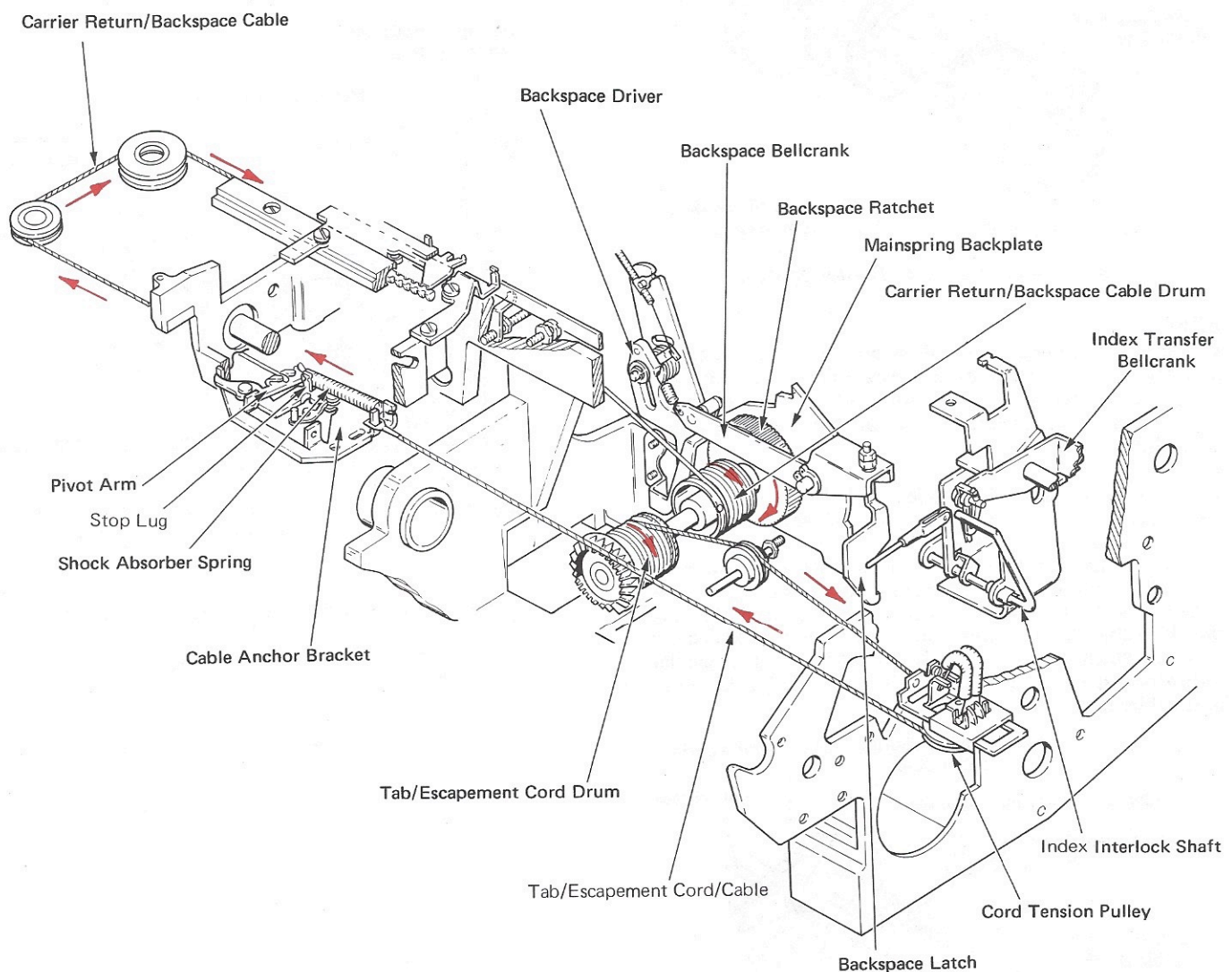


Figure 1 – Rotary Backspace Mechanism (Right Front View)

As the latch is pulled downward by the cam follower, it pulls downward on the right end of the bellcrank causing the left end to move upward. The bellcrank is connected to the driver by the driver links and spring. As the left end of the bellcrank moves up, it pulls up on the driver links. The manner in which the driver spring and driver links are connected to the driver cause it to initially pivot or rotate on its mounting stud until it contacts the backspace ratchet (Figure 5).

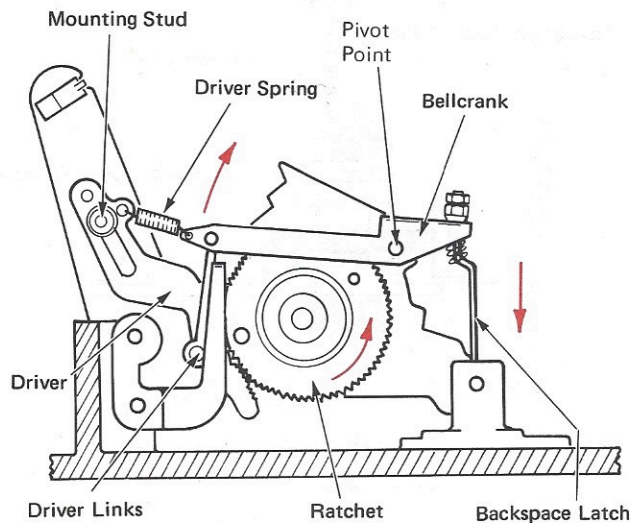


Figure 5 – Initial Driver And Bellcrank Motion
(Front View)

When the backspace driver teeth have seated in the teeth of the backspace ratchet, the driver no longer pivots but starts to drive upward in its elongated slot, rotating the backspace ratchet (Figure 6).

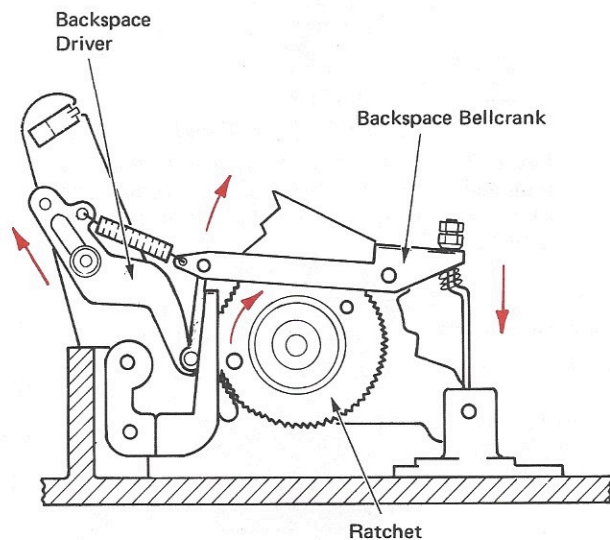


Figure 6 – Rotary Backspace Operated Position
(Front View)

The amount of pull on the carrier return/backspace cable must be controlled to enable the rotary backspace to operate reliably in either 10 or 12 pitch. This is accomplished by a pitch cam which is mounted on the backspace driver mounting stud. A stud on the driver rests on top of the camming surface of the pitch cam. The driver stud resting on the low dwell or high dwell of the pitch cam controls the rest position (initial pivot point) of the driver. This determines at what point the driver engages the backspace ratchet. In the 10 pitch mode, the driver engages the ratchet at a lower point giving more rotary motion to the ratchet. In the 12 pitch mode, its pivot point is higher, therefore, engaging the ratchet at a higher point giving less motion. The position of the pitch cam is controlled by a cable connected to the switch pitch lever (Figure 7).

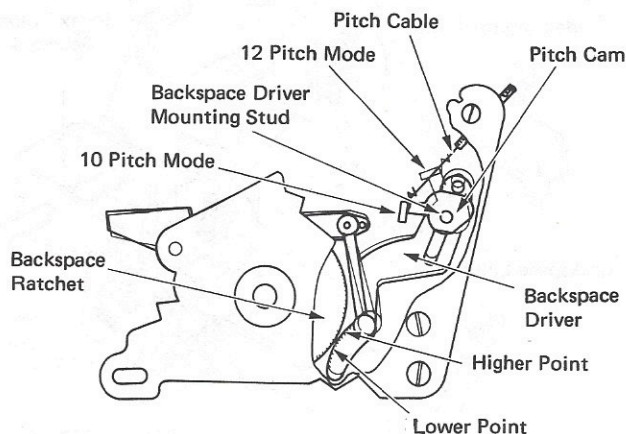


Figure 7 – Rotary Backspace Switch Pitch Operation
(Rear View)

INDEX INTERLOCK

Since the rotary backspace mechanism uses the same cam and cam follower as carrier return and index, it is necessary to interlock the index mechanism during a backspace operation. The lower index link is connected at the bottom to the index multiplying lever. It is connected at the top by a stud in a slot in the index transfer bellcrank. The top of the link is spring loaded toward the front, therefore, its rest position is in the front of the slot. When carrier return or index is operated, the top of the link maintains its rest position in the slot and operates the index transfer bellcrank (Figure 8).

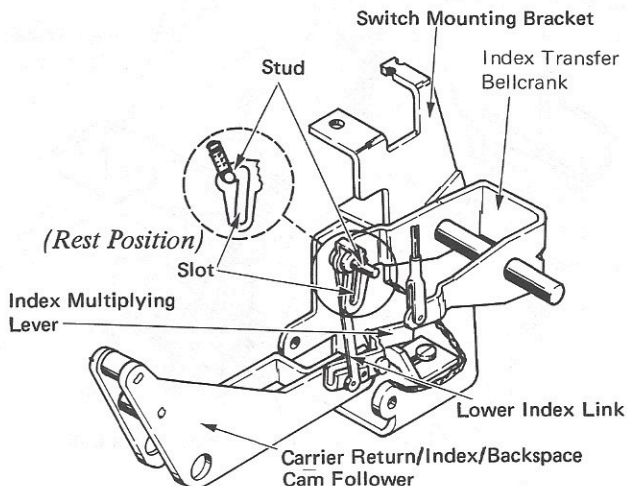
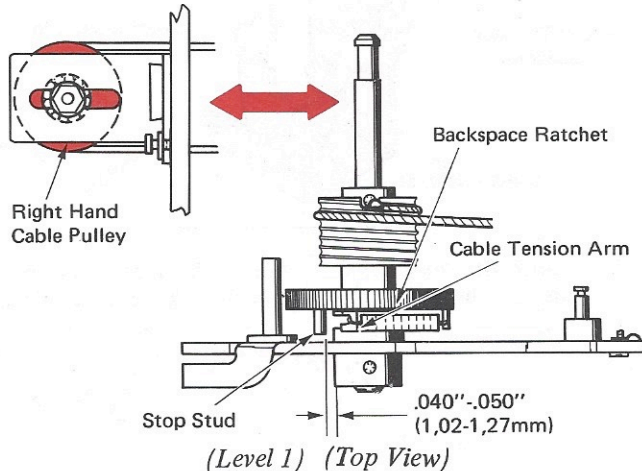


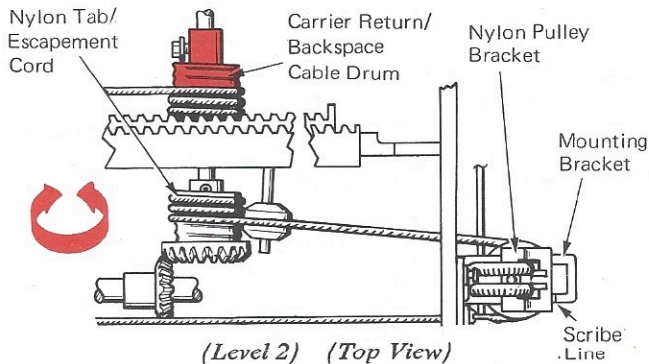
Figure 8 – Index Interlock Normal Index Operation
(Right Front View)

3. **Transport Cable Tension** – Adjust the right-hand cable pulley left or right so the cable tension arm clears the stop stud on the backspace ratchet by .040”-.050.”

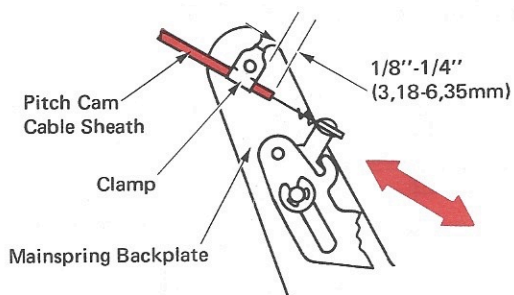
NOTE: If the right-hand cable pulley reaches either extreme of its adjustment slot, the tab/escapement cable drum must be repositioned rotationally on the escapement shaft.



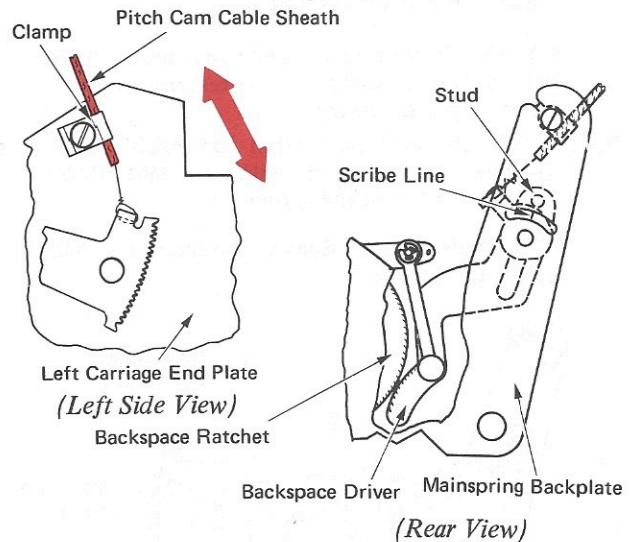
Level 2 – On dual transport equipped machines (nylon tab/escapement cord), adjust the carrier return/backspace cable drum so the nylon pulley bracket aligns with the scribe line on the mounting bracket.



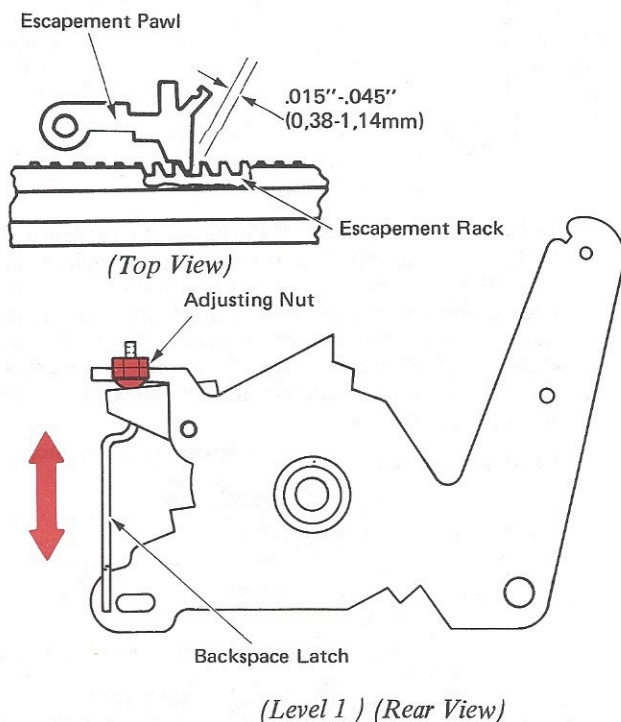
4. **Pitch Cam Cable Sheath** – The pitch cam cable sheath should extend 1/8 to 1/4 inch beyond the clamp on the mainspring backplate.



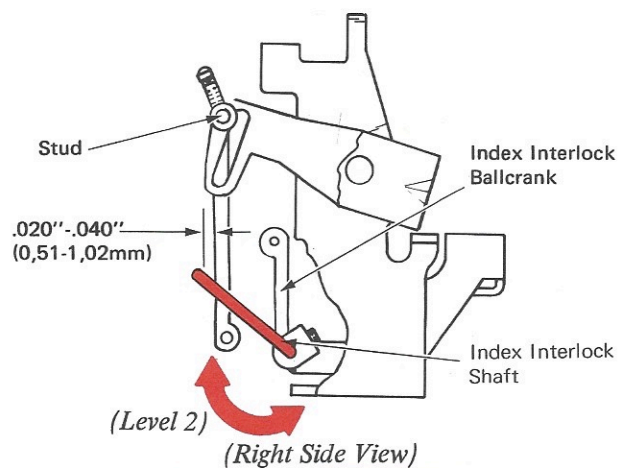
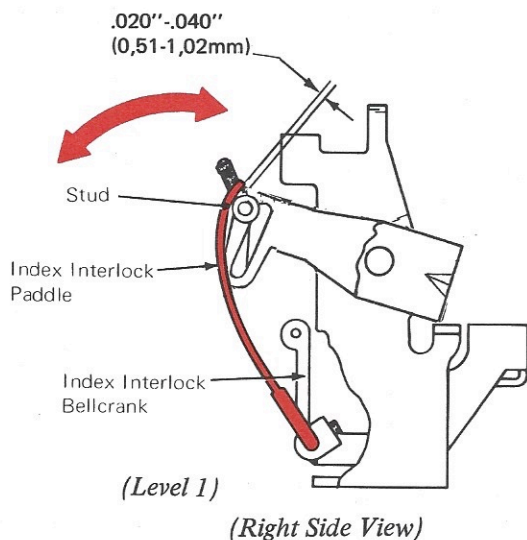
5. **Pitch Cam** – In the 12 pitch mode, hand cycle the backspace until the driver just seats in the ratchet. Adjust the pitch cam cable sheath on the left carriage end plate so the scribe line on the pitch cam lines up with the center of the stud on top of the backspace driver. Observe this condition through the hole in the backplate.



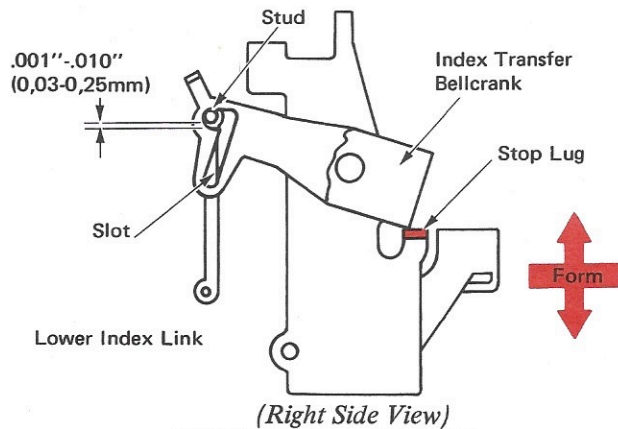
6. **Backspace Motion, Level 1** – Place the machine in the 10 pitch mode and position the carrier approximately in the center of the writing line. Hand cycle 5 consecutive backspaces. Adjust the nut on top of the backspace latch so that all 5 backspaces travel an additional .015”-.045” after the escapement pawl drops into the next rack tooth. This must be checked for 5 backspaces because the motion at the carrier can vary as much as .020.” You may need to manually place the latch beneath the cam follower to check this adjustment.



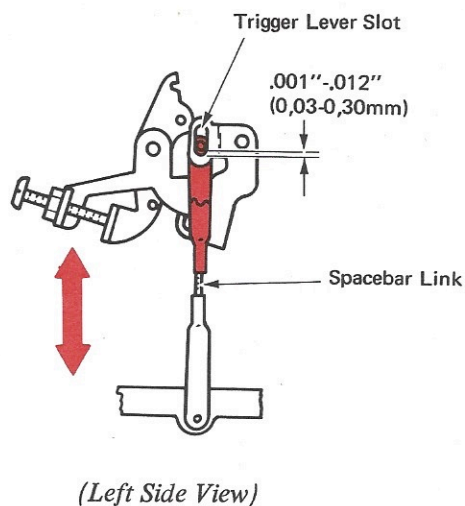
11. *Index Interlock Paddle, Level 1* – Loosen the set-screw on the index interlock bellcrank. Adjust the paddle front-to-rear for .020"-.040" clearance to the stud on the lower index link. Position the bellcrank left or right to ensure the interlock link does not bind in the backspace latch or at the clevis.



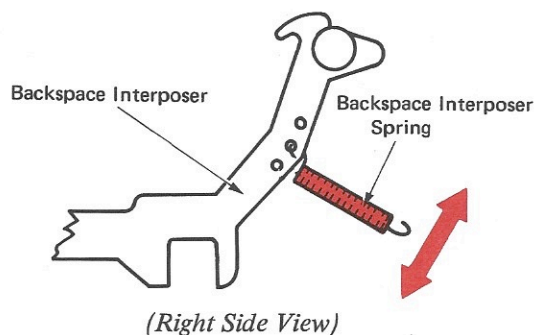
12. *Index Transfer Bellcrank Stop Lug* – Form the index transfer bellcrank stop lug for .001"-.010" clearance between the stud on the lower index link and the lower horizontal edge of the slot in the index transfer bellcrank. This will ensure that the lower index link stud reliably restores to the front of the slot after a backspace operation.



13. *Spacebar Link* – With the escapement trip link properly adjusted, adjust the spacebar link for .001"-.012" between the clevis pin and the bottom of the slot in the trigger lever.



14. *Backspace Interposer Spring* – The backspace interposer spring must be in the center hole in the interposer.



HALF BACKSPACE OPERATIONAL THEORY

The half backspace mechanism enables the typist to operate a lever which moves the carrier one half space to the left. As long as the half backspace lever is held forward, the carrier remains one half space to the left and the typewriter will type between the normal escapement positions. This is accomplished by moving the escapement rack one half space to the left (Figure 1).

The movement of the escapement rack is accomplished by the half backspace lever, operating link, cam lever and half

backspace cam when the half backspace lever is operated it pulls up on the operating link, which rotates the cam lever forcing it to the left out of its seated position with the half backspace cam. The cam lever then contacts the escapement rack gear, which is setscrewed to the escapement rack. This camming action moves the escapement rack to the left, moving the escapement pawl and carrier to accomplish a half backspace operation (Figure 1).

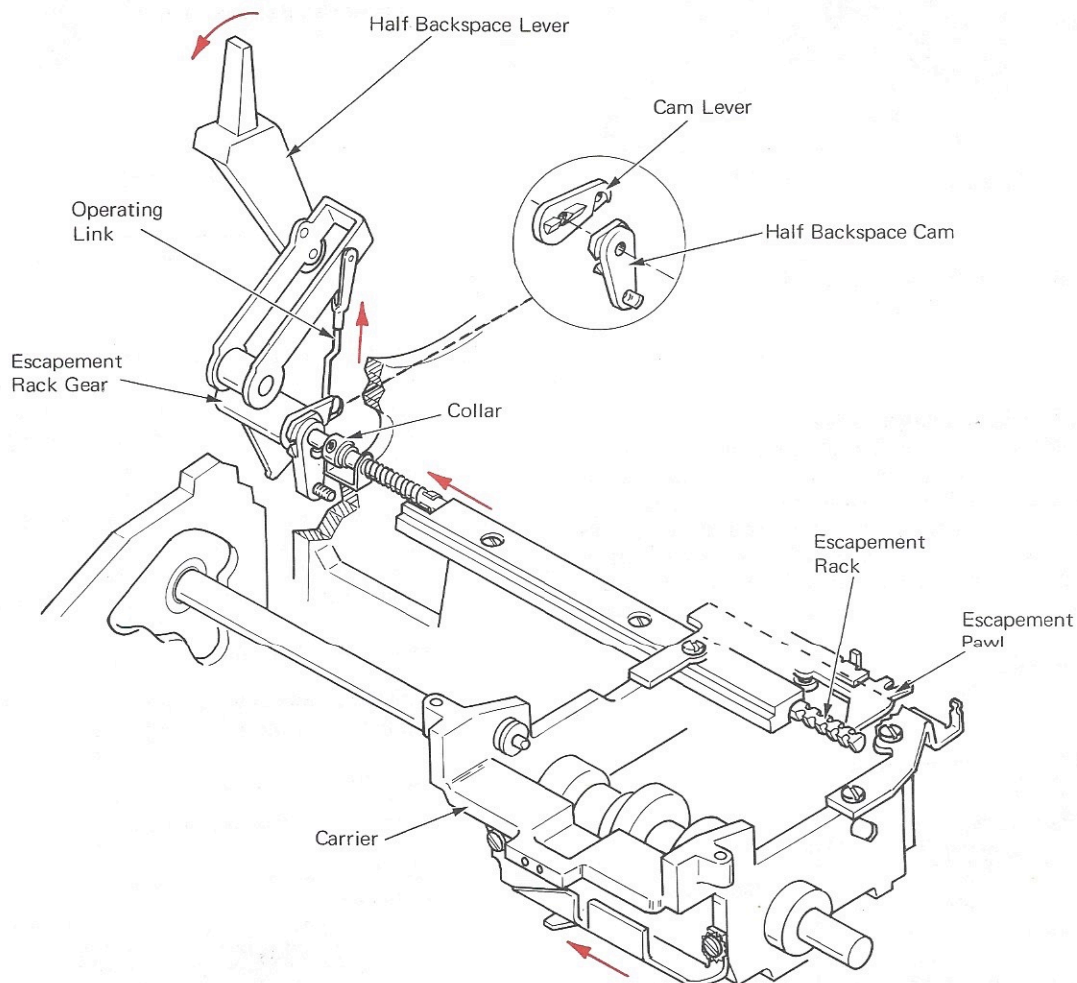
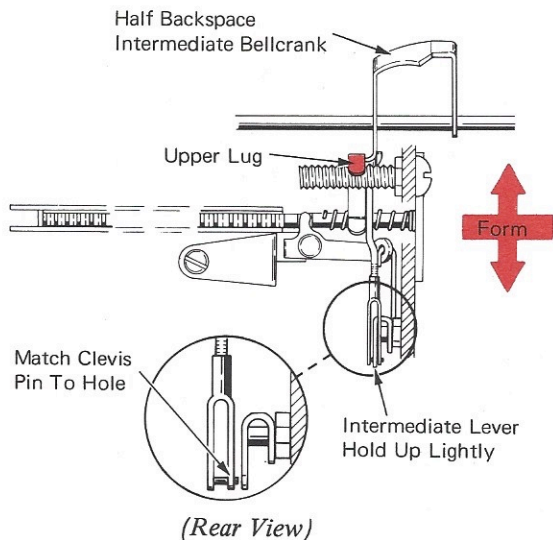
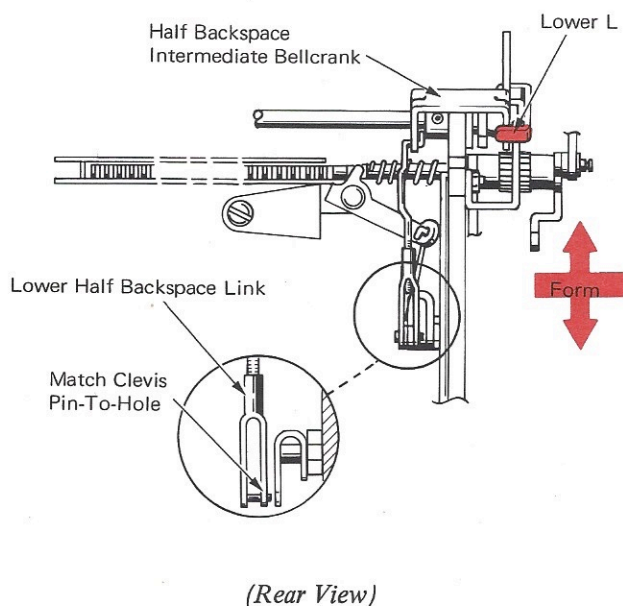


Figure 1 – Half Backspace Mechanism

3. **Half Backspace Rest Position (Level 1)** – On machines prior to “A frame” paper feed, disconnect the lower half backspace link. Hold the rear of the half backspace intermediate lever up lightly. Form the upper lug on the half backspace intermediate bellcrank so the pin in the clevis just matches the hole in the intermediate lever. This ensures that the escapement rack will rest against the pin in the escapement rail when the half backspace mechanism is at rest.



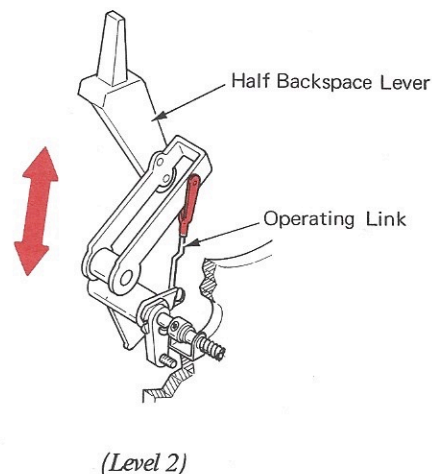
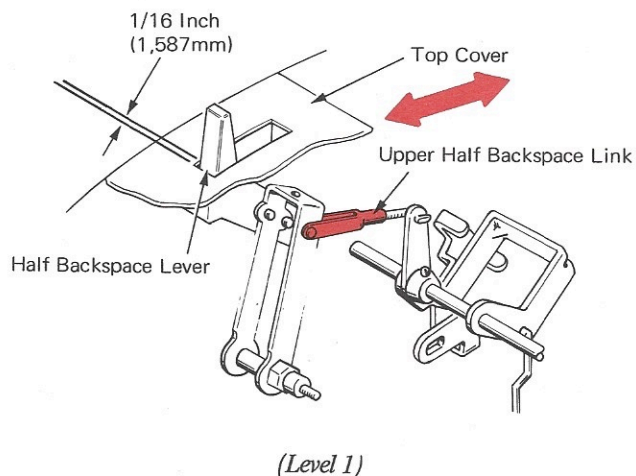
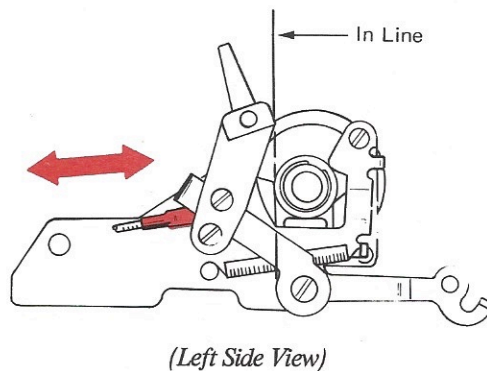
Half Backspace Rest Position (Level 1) – On level 1 machines equipped with “A frame” paper feed, form the lower stop lug on the half backspace bellcrank control bracket so the pin in the clevis just matches the hole in the intermediate lever.



4. **Half Backspace Lever (Level 1)** – Adjust the upper half backspace link so the front edge of the half backspace lever is in line with the rear edge of the platen bearing.

After the machine is placed in the covers, refine the link so that the lever clears the end of the cover slot by about 1/16” when it is in the operated position.

On level 2 machines adjust the operating link to obtain this condition.



EXPRESS BACKSPACE OPERATIONAL THEORY

The purpose of the express backspace mechanism is to enable the operator to move the carrier rapidly to the left from the keyboard. When the operator depresses the express backspace keybutton the carrier will move to the left at the same speed as carrier return with the escapement pawl dragging. The carrier movement stops when the keybutton is released or the left margin is reached.

The express backspace bellcrank pivots on an extension of the operational cam check pawl shaft. The express backspace shoe is mounted on the left leg of the bellcrank which is positioned directly under the carrier return clutch spring. When the EXP keybutton is depressed, the keylever pawl moves downward and pushes on the right leg of the bellcrank. This causes the left leg to pivot upward and press the express backspace shoe against the carrier return clutch spring. The carrier return clutch spring drives the carrier return pinion moving the carrier to the left (Figure 1).

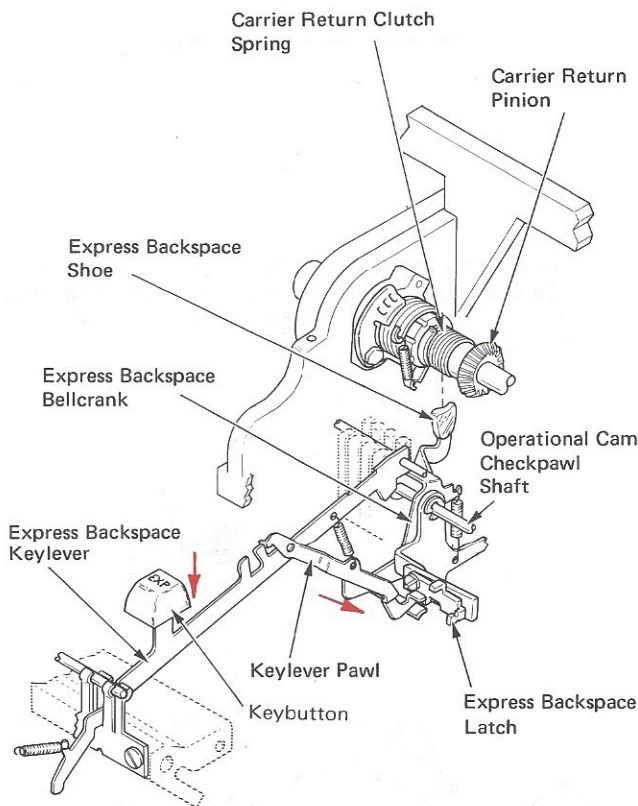


Figure 1 – Express Backspace

EXPRESS BACKSPACE LATCH (SINGLE PITCH ONLY)

On the single pitch "Selectric" II Typewriter, there would be a possibility of the carrier holding on the backspace pawl when the express backspace keybutton is released and the carrier stops. An additional part, called the express backspace latch, prevents this from happening by causing a backspace operation when the EXP keybutton is released. The express backspace latch is mounted on the operational keylever pawl guide. When the EXP key is depressed the express backspace keylever pawl rotates the express backspace latch which trips the backspace interposer. At the same time another extension of the latch moves behind a latching surface on the interposer and prevents it from traveling far enough to the rear to release the operational cam. When the EXP key is released, it allows the express backspace latch to restore upward, allowing the interposer to continue to the rear tripping a backspace operation (Figure 2).

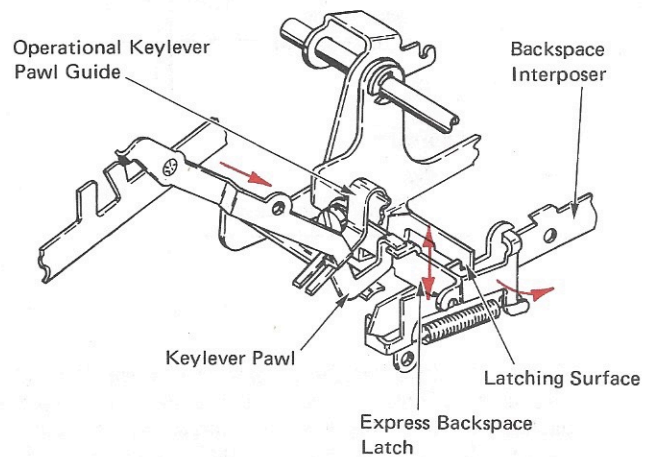
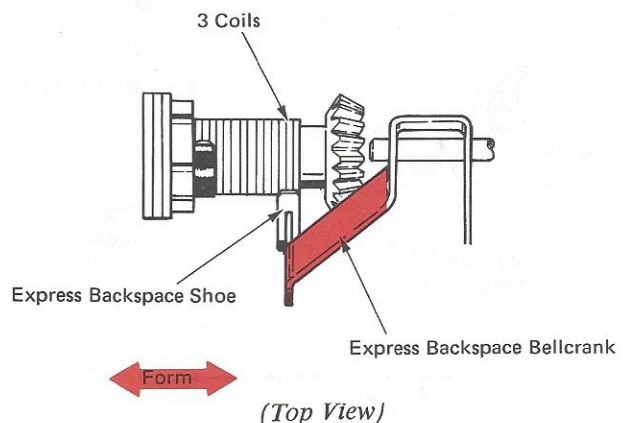


Figure 2 – Express Backspace (Single Pitch)

EXPRESS BACKSPACE ADJUSTMENTS

1. *Express Backspace Shoe Overlap* – Form the left arm of the express backspace bellcrank so the express backspace shoe overlaps three coils of the carrier return clutch spring.



The purpose of the tab mechanism is to rapidly move the carrier to the right to a predetermined point on the writing line. This is accomplished by removing the escapement and backspace pawls from their respective racks and allowing the carrier to be pulled to the right under mainspring tension (Figure 1). When the carrier reaches a preset tab stop, the pawls are returned to their racks and the carrier is held in the new position.

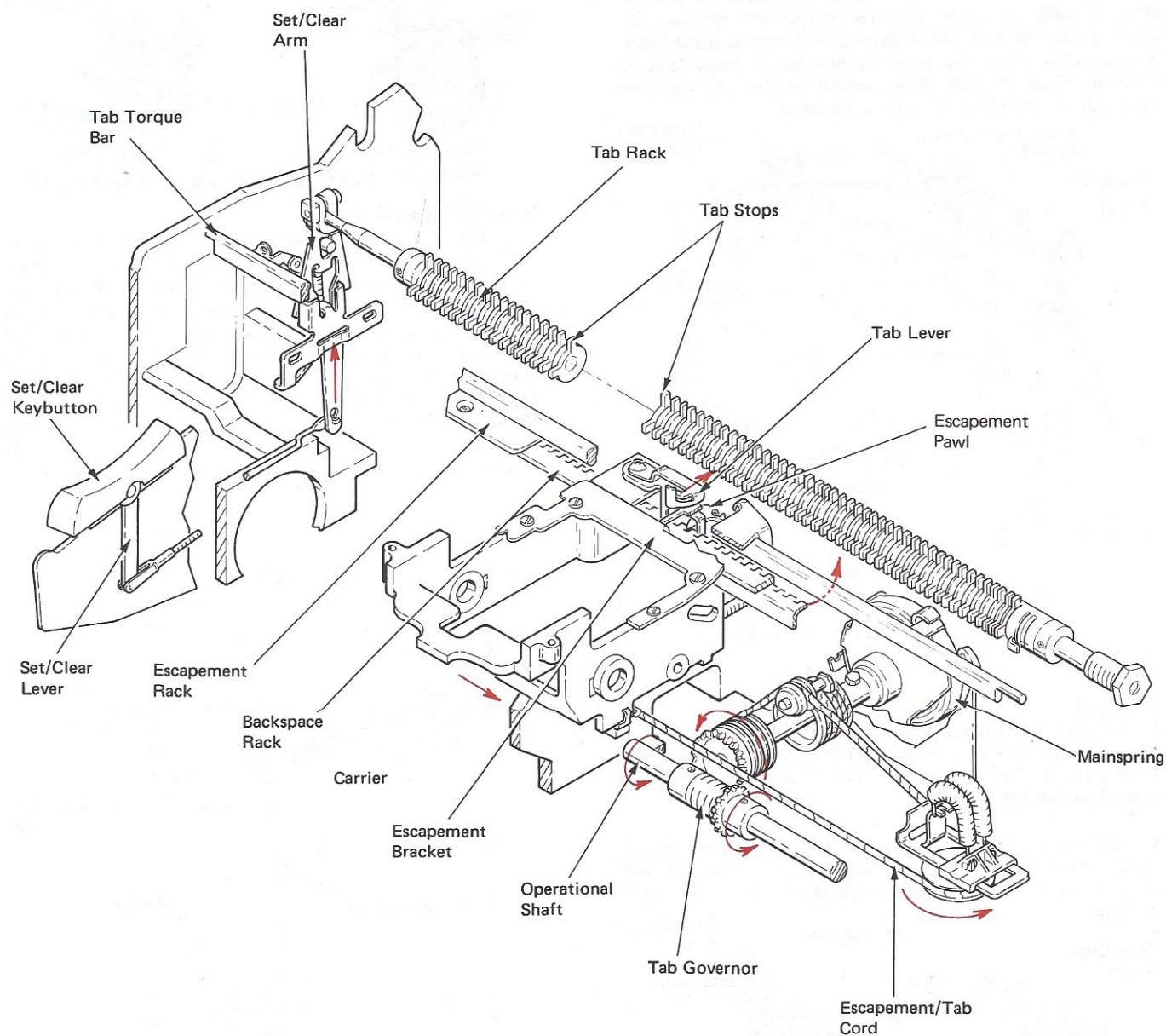


Figure 1 – Tab Mechanism

TAB LEVER OPERATION

Pawl removal is initiated by the torque bar pushing against the tab trigger. The lower lug of the tab lever trigger pushes the tab lever to the rear (Figure 6).

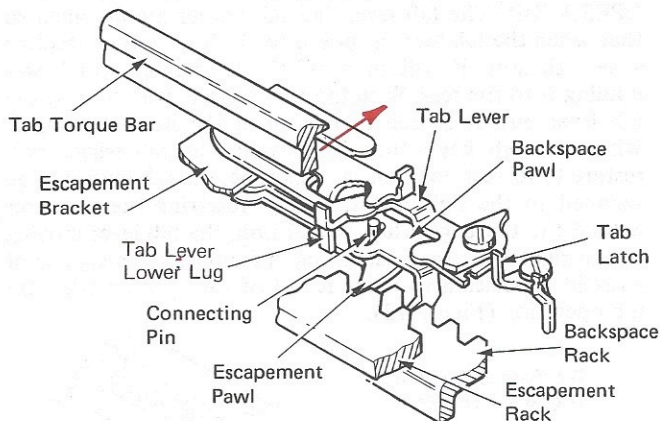


Figure 6 – Tab Lever Operation (Right Front View)

As the tab lever is moved to the rear, its lower lug contacts the backspace and escapement pawls and moves them to the rear out of their racks (Figure 7). When the escapement pawl just clears its rack, it is pulled to the right by the pawl spring. The backspace pawl will move to the right an equal amount because of the upright stud connection between the escapement pawl and backspace pawl.

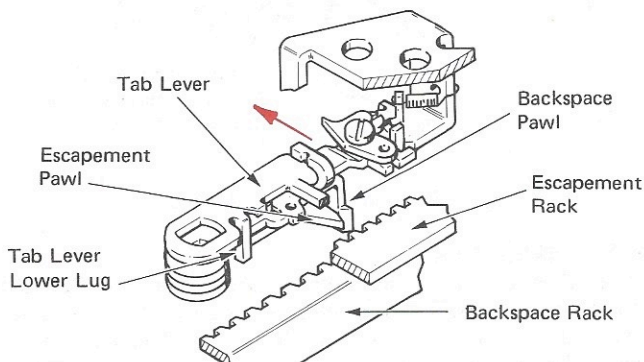


Figure 7 – Tab Lever Operation (Left Front View)

TAB LATCHING

As soon as the escapement and backspace pawls are removed from their racks, the carrier will be allowed to move to the right under mainspring tension.

As the tab lever continues to move to the rear, the tab lever latch engages a notch in the tab lever to latch the mechanism in its operated position and to prevent the tab lever from overthrowing into the tab rack. With the tab lever latched, the tab pawl (mounted on the tab lever) is now in a position to contact the next set tab stop as the carrier moves to the right (Figure 8).

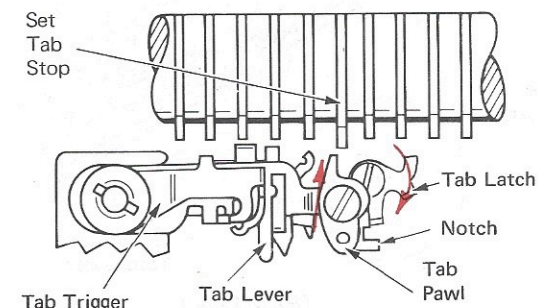


Figure 8 – Tab Latching Operation (Top View)

ON EARLY LEVEL MACHINES

As the pawls move to the right, they are also moved further to the rear by the tab lever. The tab lever will continue to be moved by the trigger until the trigger is restricted by the tab overthrow stop. When the keybutton is released, the tab lever will be held to the rear by the tab lever latch (Figure 9).

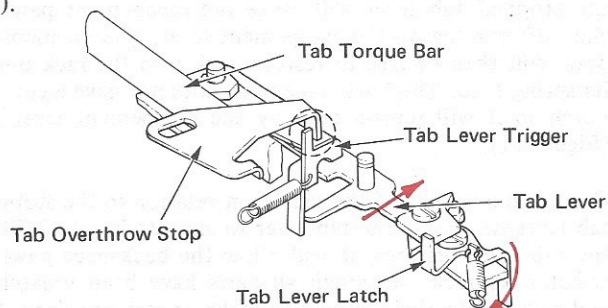


Figure 9 – Tab Overthrow Stop

TAB GOVERNOR

The carrier speed during a tab operation is controlled to prevent parts breakage or rebounding to the wrong position. The tab governor controls the carrier speed by limiting the speed at which the mainspring tension can turn the escapement cord drum to wind up the tab/escapement cord (Figure 10).

The beveled gear of the escapement cord drum meshes with the tab governor pinion gear. The governor pinion gear mounts on the operational shaft between two collars that are setscrewed to the operational shaft. The left collar and the pinion gear have hubs that are connected by a clutch spring. The clutch spring is wound so that it slips when the pinion gear is held stationary and the operational shaft is turning (Figure 10).

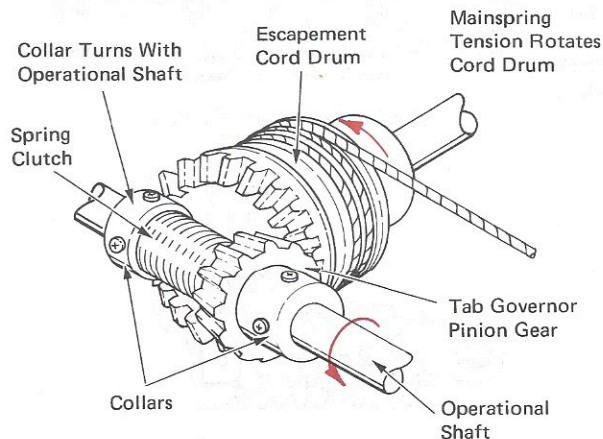


Figure 10 – Tab Governor Mechanism

During a tab operation, the escapement cord drum rotates the tab pinion gear in the same direction as the operational shaft. As soon as the rotational speed of the pinion gear attempts to exceed that of the operational shaft, the clutch spring tightens around the two hubs locking the pinion gear and the collar together. Since the collar is setscrewed to the operational shaft, the speed of the escapement cord drum will be limited to the speed of the operational shaft.

CARRIER RETURN/TAB INTERLOCK

The carrier return tab interlock allows a tab operation to supersede or unlatch a carrier return operation once the carrier return operation has begun. Pressing the tab key-button during a carrier return operation will pivot the tab torque bar to the rear so that a lug on its right end will pivot the carrier return/tab interlock extension of the carrier return latch keeper. When the carrier return/tab interlock lever is pivoted by the torque bar, the extension will unlatch the carrier return (Figure 14).

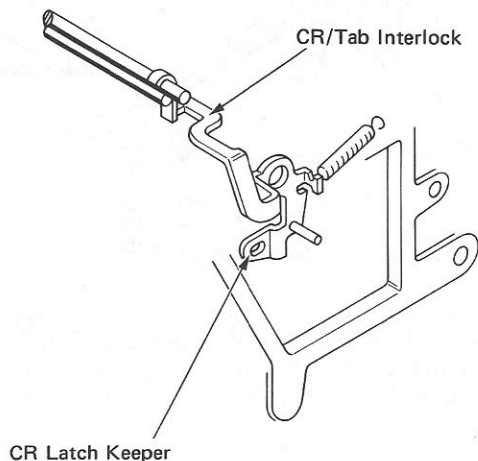
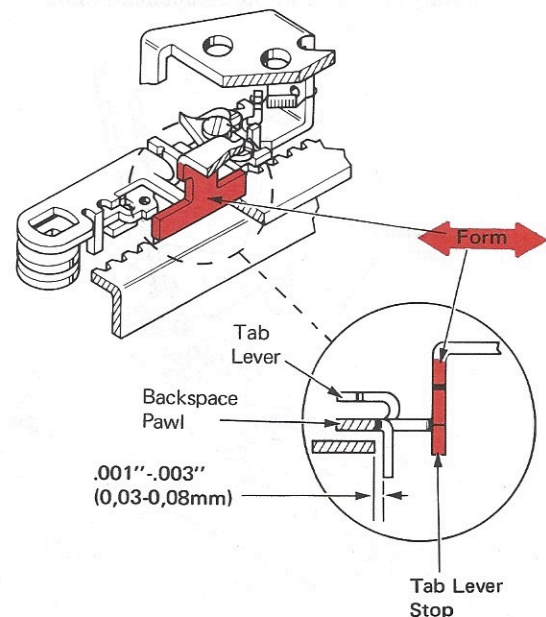


Figure 14 – Carrier Return/Tab Interlock
(Right Front View)

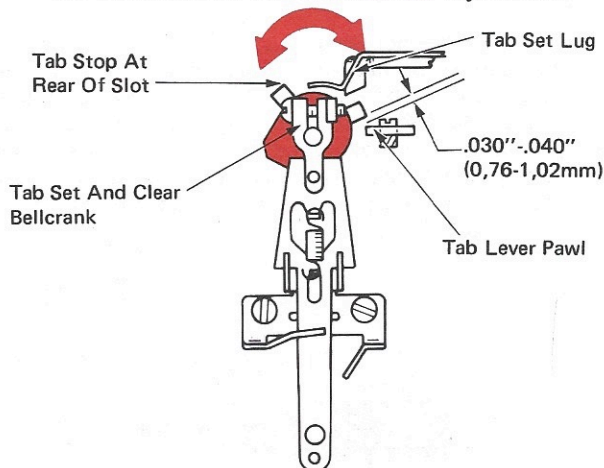
2. **Tab Lever Stop** – Form the stop front-to-rear for a clearance of .001"-.003" between the vertical lug on the tab lever and the backspace pawl when the pawl is bottomed in its rack.

NOTE: Make sure all escapement bracket and print escapement adjustments are correct before forming this stop.



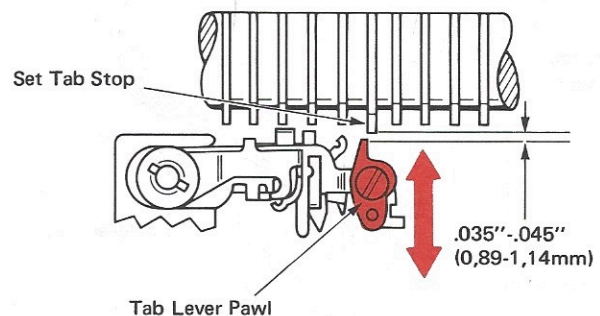
TABULATION ADJUSTMENTS

1. **Tab Rack Radially** – Push all tab stops to the rear of their slots. With the tab lever latched to the rear, the top surface of the tab lever pawl should be .030"-.040" below the lower edge of the tab stop. Loosen the screw on the tab set and clear bellcrank and rotate the tab rack to make this adjustment.



(Left Side View)

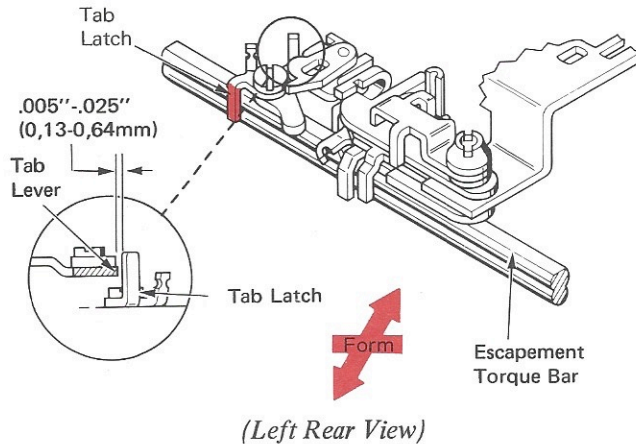
3. **Tab Lever Pawl** – Adjust the tab lever pawl front-to-rear for .035"-.045" clearance between the tip of the tab lever pawl at rest and the set tab stops. The adjustment of the tab lever pawl has an effect on the amount of overlap between the tab stop and the pawl tip in the active position.



(Top View)

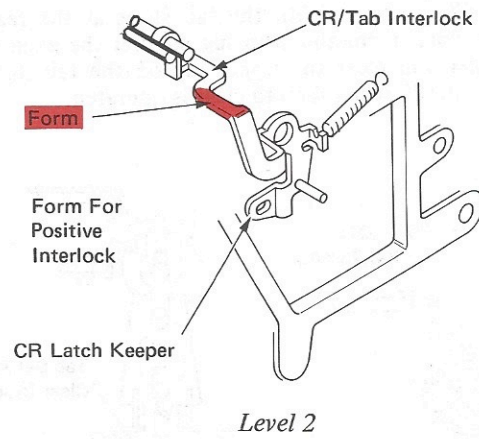
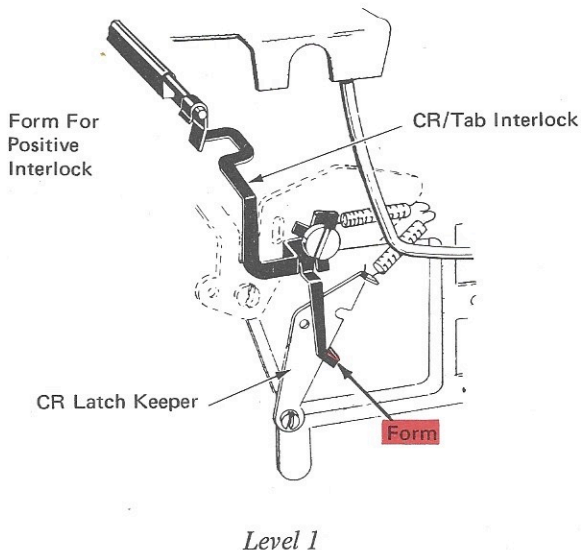
9. **Tab Interlock** – With the carrier return clutch latched, the escapement torque bar should rotate the tab latch away from the tab lever by .005"-.025."

This adjustment is obtained by forming the lug on the tab latch that extends down behind the escapement torque bar. The adjustment ensures that the carrier return and tab cannot both be latched out simultaneously. If both were allowed to latch, the tab lever pawl would lock against a set tab stop during the carrier return operation.



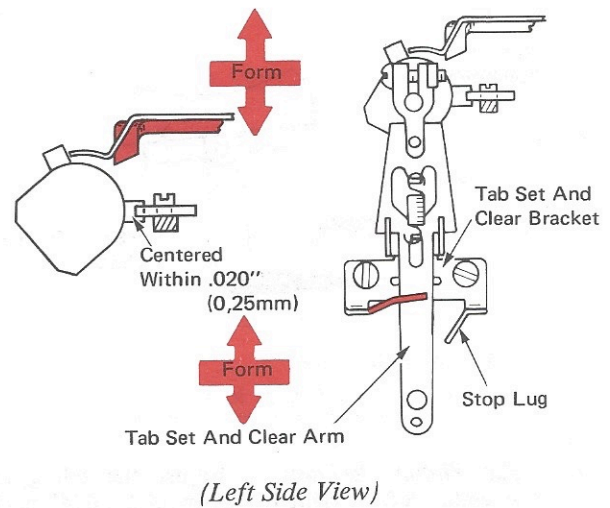
10. **Carrier Return/Tab Interlock** – Form the lug of the interlock to obtain the following conditions:

- With the carrier return mechanism latched, the interlock should pull the carrier return latch keeper forward just enough to release the latch when the tab keylever is fully depressed.
- With the carrier return mechanism at rest, full depression of the tab keylever should not cause the carrier return keeper to move away from the latch.

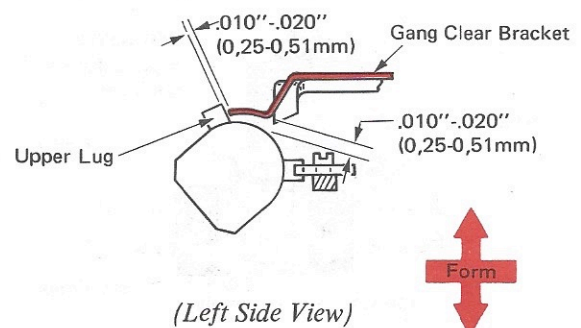


11. **Tab Set Lug** – Form the stop lug on the tab set and clear bracket so that when a tab stop is set, the tab lever pawl will contact the center of a set tab stop $\pm .010$."

If the tab stops, located on either side of the tab stop that is being set, contact the underside of the tab clear bracket before the proper set position is obtained, the tab set finger at the rear of the escapement bracket should be formed down.



12. **Gang Clear Bracket** – The gang clear bracket should be adjusted front-to-rear for .010"-.020" clearance with the clear lug of a set tab stop. The clear bracket should be formed up or down for .010"-.020" clearance with the tab rack.



DUAL PITCH TABULATION OPERATIONAL THEORY

The dual pitch tab mechanism can operate in either 10 or 12 pitch without any mechanical switching. This is accomplished by a universal tab rack. The tab stops are spaced in such a way that the escapement pawl will reenter the proper rack tooth correctly in either pitch (Figure 1).

Dual pitch tab provides the operator with the same features as single pitch tab, but with two additional instructions:

1. The machine will not reliably tab from within one space of a set tab stop.

2. Before switching pitch, all tab stops should be cleared and necessary tab stops reset after the pitch is changed.

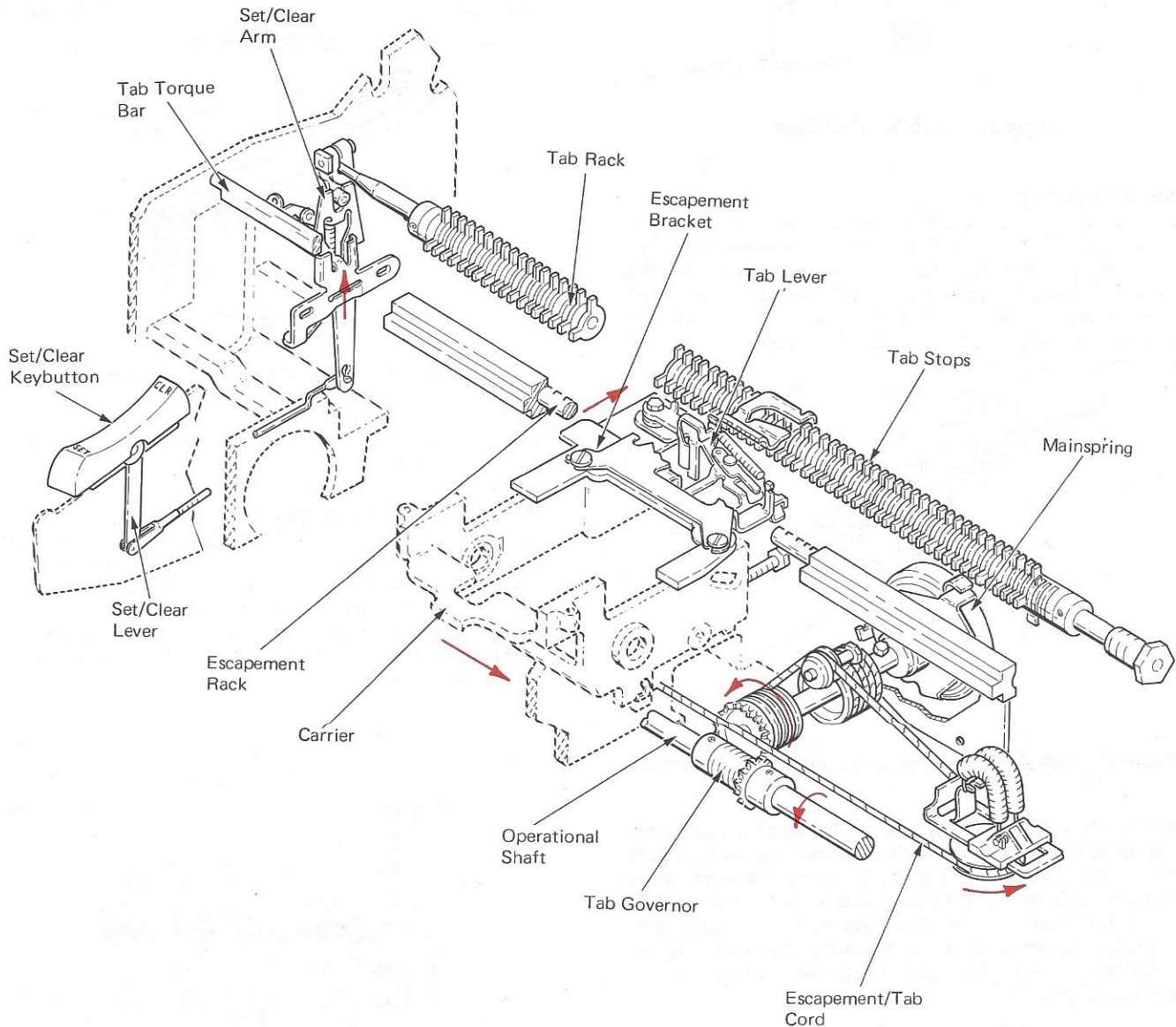


Figure 1 – Dual Pitch Tab

UNIVERSAL TAB STOP SPACING

The tab stops are spaced on the universal tab rack to accommodate both 10 and 12 pitch escapement racks. Figure 7 shows the tab lever pawl contacting a tab stop, if it were set, and approximately where the escapement pawl starts to enter the escapement rack tooth for that stop. Every 1/2 inch (5 teeth in 10 pitch and 6 teeth in 12 pitch) an escapement rack tooth is common for both pitches; therefore, the tab stop spacing is repeated every 1/2 inch (Figure 7).

This is shown for illustrative purposes only. Keep in mind that the machine will not tab reliably from within one pace of a set tab stop.

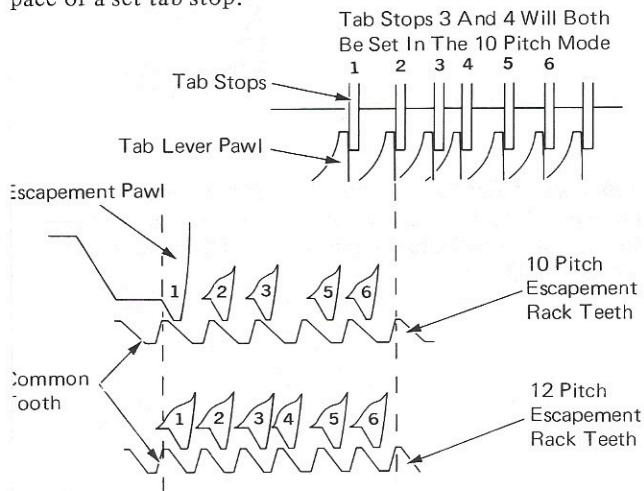


Figure 7 – Universal Tab Stop Spacing

DUAL PITCH ESCAPEMENT

In the dual pitch escapement mechanism, the vertical position of the escapement pawl is critical. The pawl must be centered in the escapement rack within the opening in the escapement rail. An escapement pawl guide bracket is mounted above the escapement pawl. The escapement pawl guide lug extends down from the bracket and is formed under the escapement pawl to control its vertical movement. The escapement pawl vertical position is controlled by the vertical position of the rear of the carrier, which is adjustable. This is accomplished by a diagonal elongated mounting slot in the rear carrier shoe. As the carrier shoe is adjusted left or right, the rear of the carrier is raised or lowered (Figure 8).

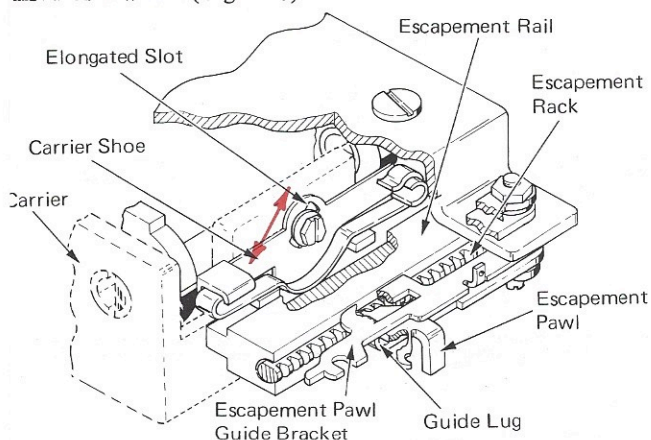
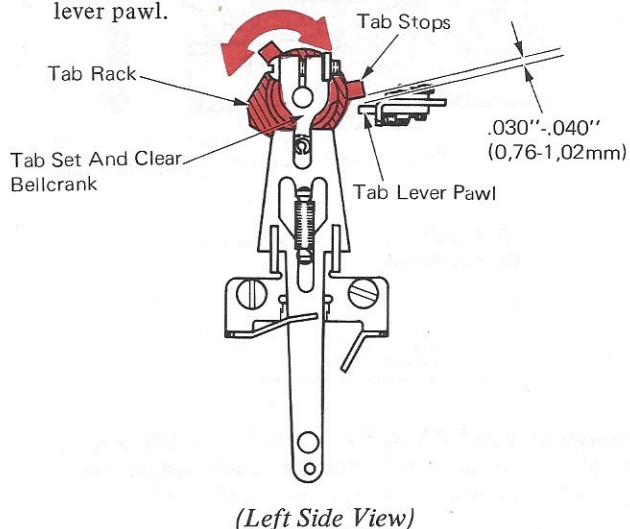


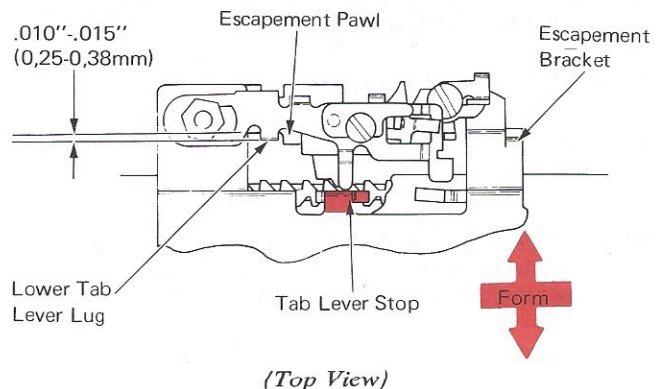
Figure 8 – Escapement Pawl And Carrier Shoe Mounting (Right Rear View)

DUAL PITCH TAB ADJUSTMENTS

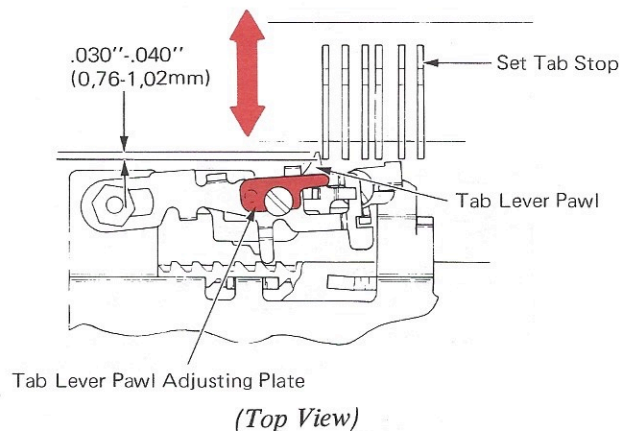
1. **Tab Rack Radially** – Position all the tab stops to the rear of their slots. Latch out the tab lever. Adjust the tab rack radially within the tab set and clear bellcrank for .030"-.040" between the tab stops and the tab lever pawl.



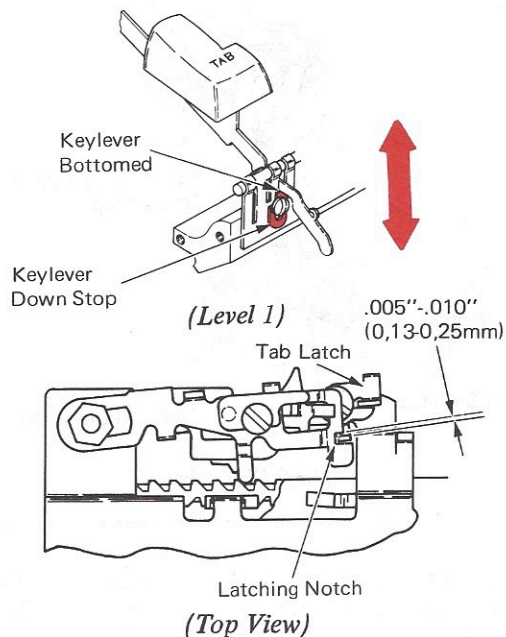
2. **Tab Lever Stop** – Form the tab lever stop on the escapement bracket so the lower tab lever lug clears the escapement pawl by .010"-.015" at rest.



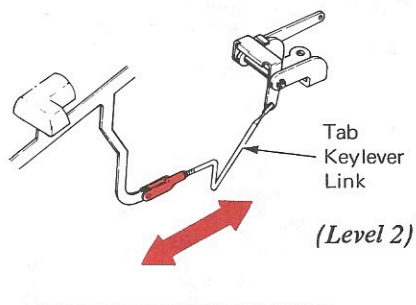
3. **Tab Lever Pawl Bite** – With the tab lever latched out, adjust the tab lever pawl adjusting plate so the tab lever pawl engages a set tab stop by .030"-.040".



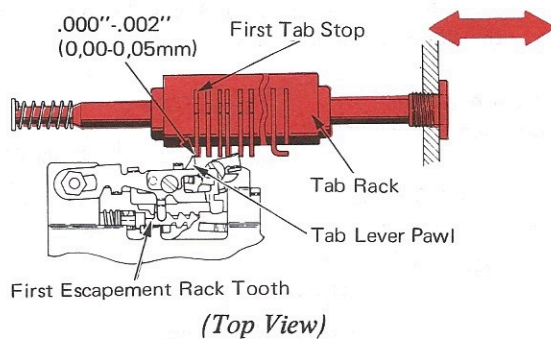
10. **Tab Keylever Down Stop** – With the tab keylever bottomed, adjust the tab keylever down stop so there is .005"-.010" clearance between the tab latch lug and the rear surface of the tab lever latching notch.



On level 2 machines with the tab keylever bottomed, adjust the tab keylever link to obtain .005"-.010" clearance between the tab latch lug and the rear surface of the tab lever latching notch.

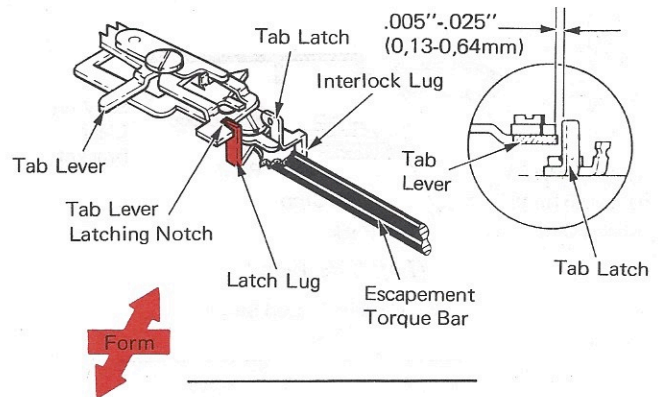


11. **Tab Rack Left-To-Right** – Place the machine in the 10 pitch mode. Set the first tab stop and position the carrier at the extreme left (first escapement rack tooth). As the tab lever is moved to the rear, adjust the tab rack left-to-right so the tab lever pawl clears the set tab stop by .000"-.002".



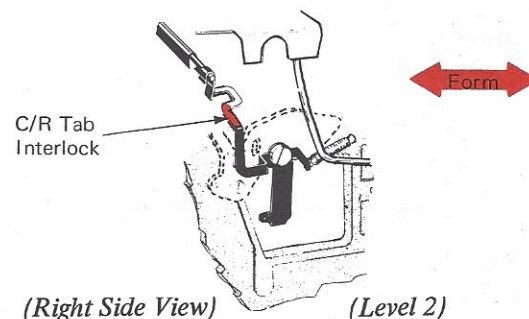
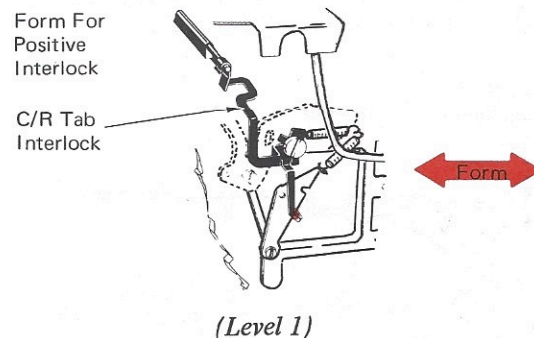
12. **Tab Interlock** – With the carrier return clutch latched, the escapement torque bar should rotate the tab latch away from the tab lever by .005"-.025".

This adjustment is obtained by forming the lug on the tab latch that extends down behind the escapement torque bar. The adjustment ensures that the carrier return and tab cannot both be latched out simultaneously. If both were allowed to latch, the tab lever pawl would lock against a set tab stop during the carrier return operation.



13. **Carrier Return/Tab Interlock** – Form the lug of the interlock to obtain the following conditions:

- With the carrier return mechanism latched, the interlock should pull the carrier return latch keeper forward just enough to release the latch when the tab lever is fully depressed.
- With the carrier return mechanism at rest, full depression of the tab keylever should not cause the carrier return keeper to move away from the latch.



PRINT OPERATIONAL THEORY

The purpose of the print mechanism is to power the typehead toward the platen. This is accomplished through a print cam located in the carrier assembly (Figure 1). When the printer is cycled for a character selection/print operation, motion is transferred by the print shaft through the print cam, a cam follower and the rocker assembly to power the typehead toward the platen.

There are two basic conditions necessary for a correct print operation. They are: correct velocity of the typehead as it strikes the paper and proper platen position.

Two levels of velocity may be selected on machines having the dual velocity feature. Alphanumeric characters receive the highest velocity while smaller characters such as punctuation and symbols receive a lower velocity.

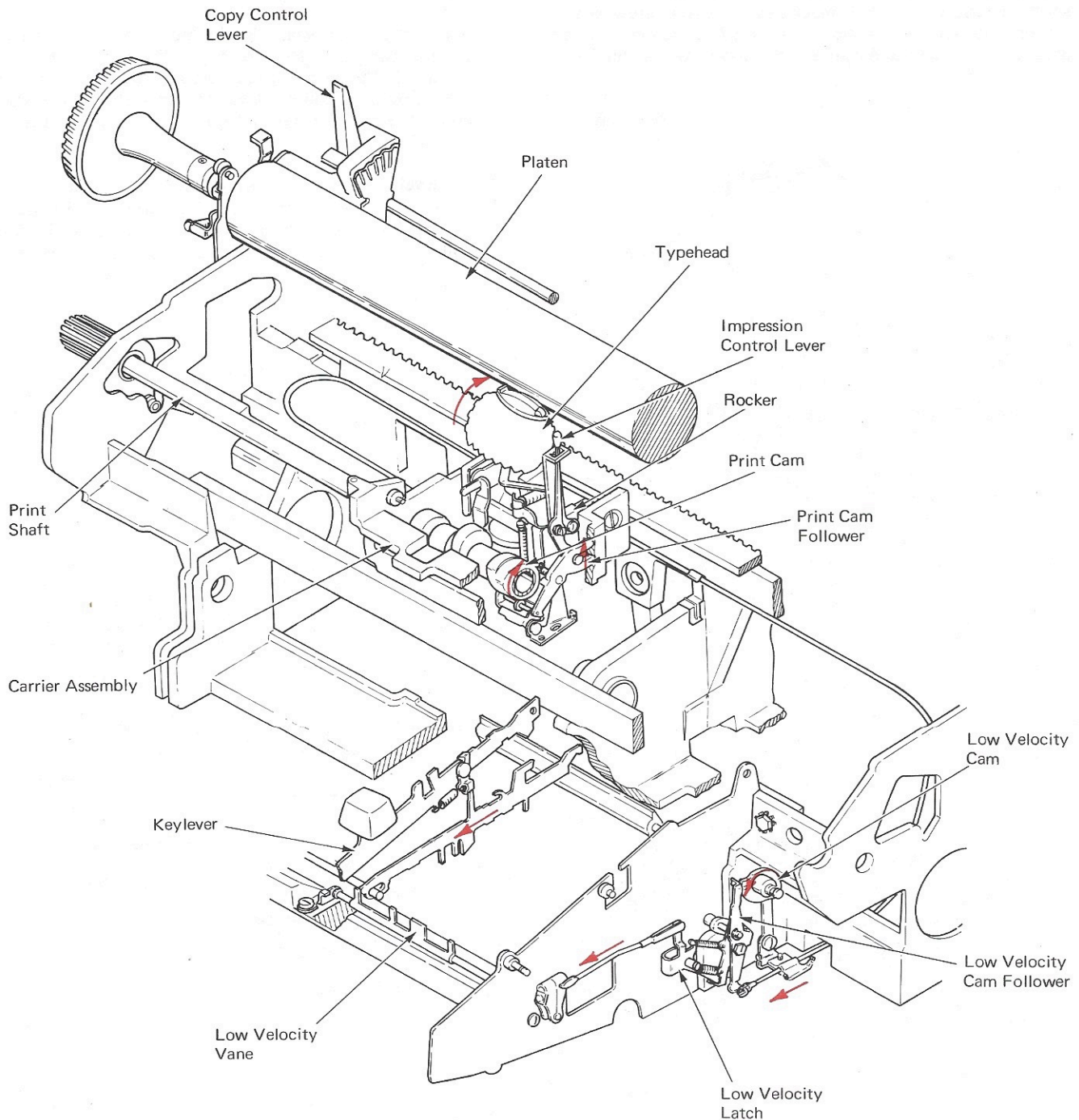


Figure 1 – Print Mechanism

IMPRESSION CONTROL LEVER (LEVEL 2)

The impression made by the typehead is determined by the velocity of the typehead upon impact with the paper. By increasing or decreasing the velocity of the typehead with the impression control lever, the impression for all characters can be changed equally.

The impression control lever may be positioned by the operator to one of five different impression settings (Figure 4). Changing the position of the impression control lever causes a pin in the lower part of the lever to move to the front or to the rear of the print cam follower arm. The front-to-rear position of the pin determines the amount of powered travel the typehead receives from the print cam follower. This, plus the amount of free flight, determines the velocity of the typehead upon impact with the paper.

Powered flight is the distance the typehead is driven by the print cam. Free flight is the amount of typehead movement from the high point of the print cam to the platen.

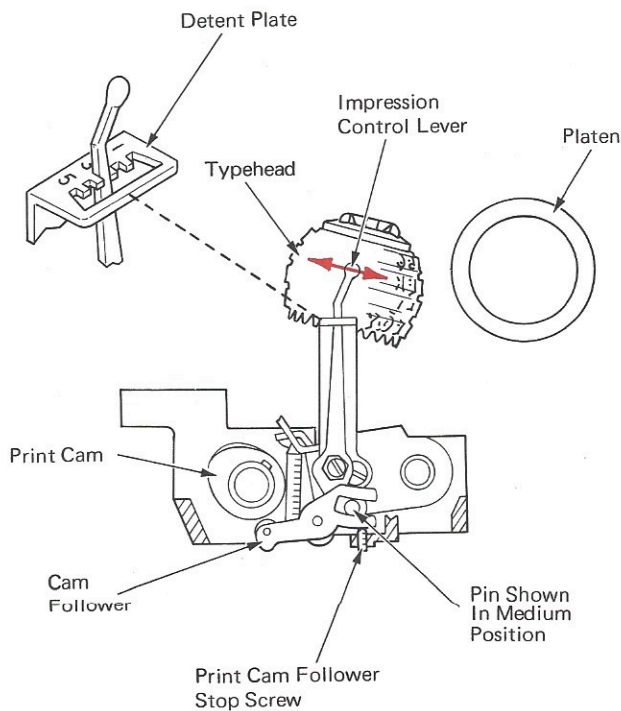


Figure 4 – Impression Control Lever
(Level 2) (Right Side View)

PRINT MECHANISM (LEVEL 1)

Level 1 machines did not have the automatic velocity control mechanism. The impression was a preset adjustment and could not be changed by the operator (Figure 5).

The print cam is a double cam. Its function is to power the typehead toward the platen and restore it to rest. A small camming surface on the right is the print cam and moves the typehead toward the platen. A larger camming surface on the left is called the restoring cam. It restores the typehead to rest and prevents it from rebounding.

The camming surface of the print cam is designed so the typehead is powered within a few thousandths of an inch of the platen. Because the typehead is powered nearly all the way to the platen, all the characters are forced to emboss the paper slightly, even those with a large surface area. To restrict the amount of free flight of the typehead so embossing will be the same for all characters, a heavy arm called the anvil striker is attached to the bottom of the carrier and acts as a stop for the rocker. Just under the front of the carrier and extending between the side frames is an anvil. It is an angle-shaped bar with the lip extending to the rear. As the typehead embosses the paper to the correct depth, the striker hits the bottom of the anvil and prevents further travel of the rocker and typehead. This means that the impression for each character will be consistent with little variation between characters.

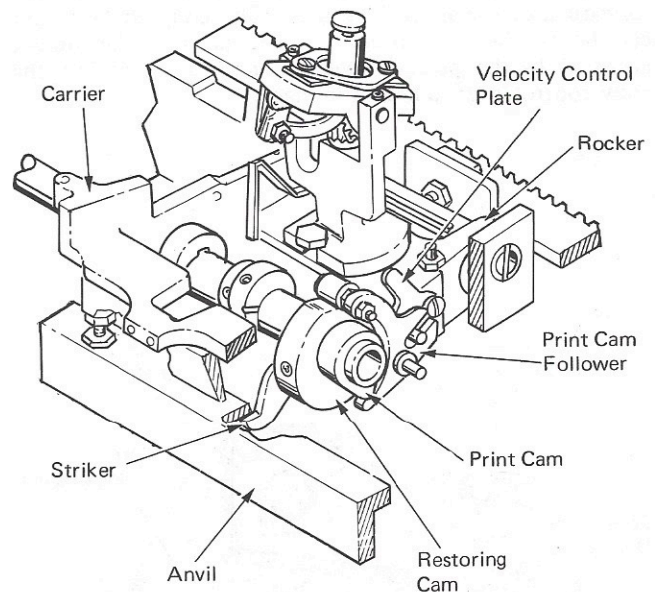


Figure 5 – Print Mechanism (Level 1)

DUAL VELOCITY SELECTION

On machines with dual velocity, when a low velocity character is selected, a pull on the velocity control cable is produced to shift the roller to the low velocity lobe on the print cam (Figure 7). A low velocity vane is mounted in the keyboard in a position to be contacted by the selector interposer as it is driven forward by the filter shaft. Attached to the right end of the low velocity vane is the low velocity vane bellcrank. Rotation of the vane and bellcrank creates a pull on the link, causing the low velocity latch to rotate counterclockwise about its mounting stud. As the latch rotates, it pivots out of the operating path of the adjustable stop attached to the low velocity cam follower. The low velocity cam follower is spring loaded against the low velocity cam. With the low velocity latch removed from its operating path, the cam follower will travel to the low dwell of the low velocity cam and create a pull on the velocity control cable.

If a high velocity character is selected at the keyboard, the low velocity latch will remain at rest in the operating path of the stop on the cam follower. The cam follower is restricted from following the contour of the cam and no pull is felt on the velocity control cable. The print cam follower roller remains to the right under the high velocity lobe of the print cam and a high velocity print operation results.

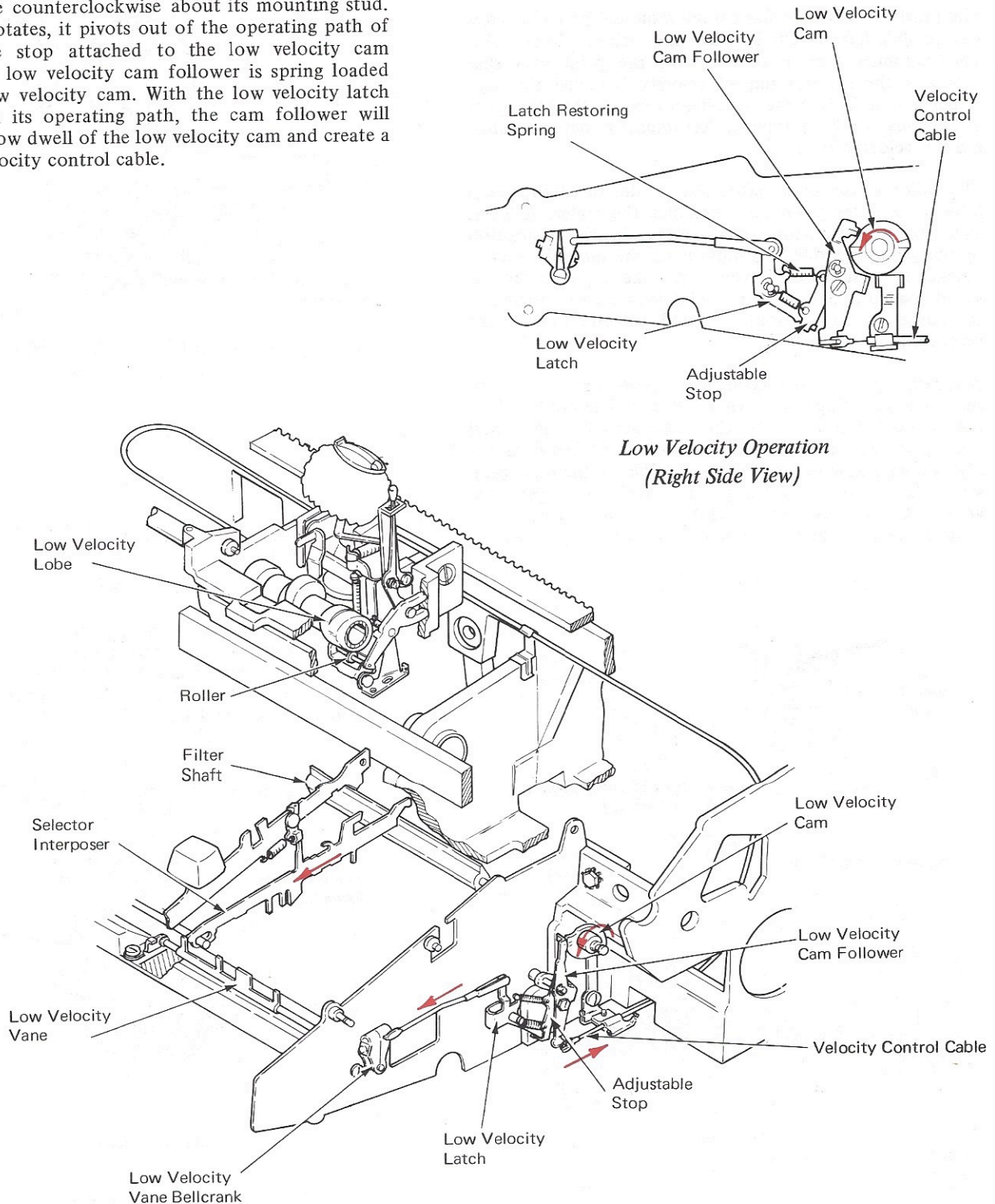
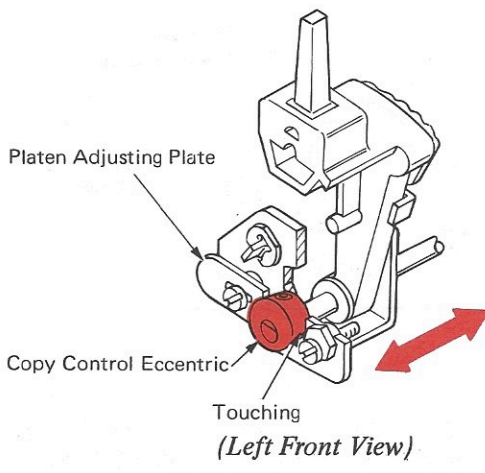
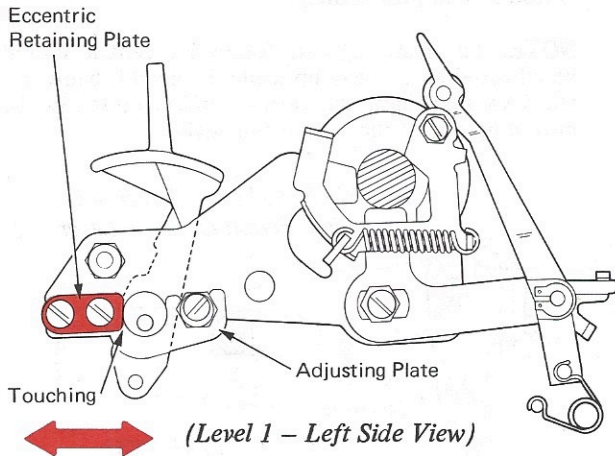
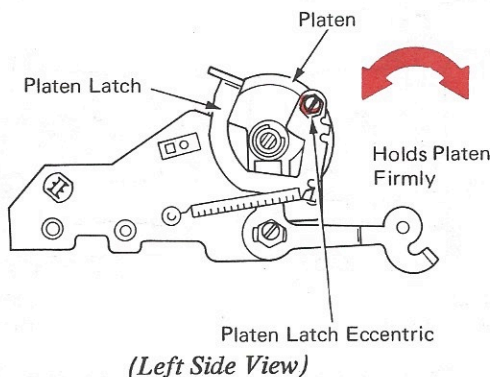


Figure 7 - Low Velocity Sequence

2. **Platen Adjusting Plates** — Adjust the eccentric retaining plates front-to-rear on level 1 machines or the copy control eccentric left-to-right on level 2 machines so there is no front-to-rear motion and no binds exist between the eccentric and the platen adjusting plates on each side of the machine.



3. **Platen Latches** — Adjust the platen latch eccentrics, with the high lobe down, so the platen is held firmly in position vertically and horizontally. The latches should latch and unlatch freely with the feed rolls released.

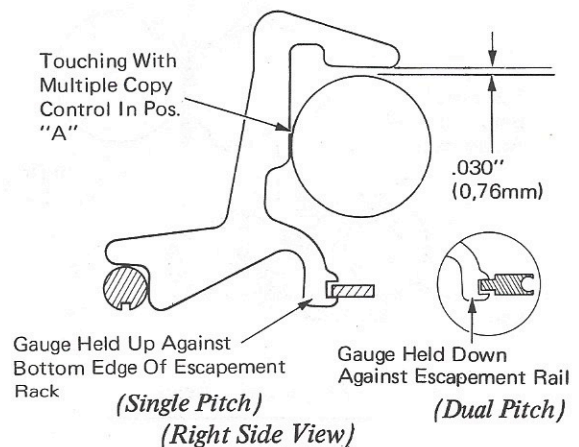
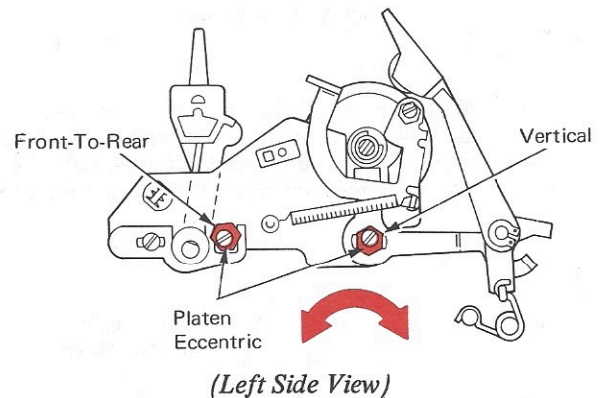


4. **Platen Position** — To properly adjust the print mechanism, the correct position of the platen must be established first and then the print adjustments made relative to the platen position. With the copy control lever forward and the print shaft keyway down, loosen the platen eccentrics and move the platen to the extreme rear and as low as possible. Insert the platen gauge on the print shaft and escapement rack at one extreme end of the machine.

- Adjust the platen front-to-rear until the platen just touches the platen gauge.
- Adjust the platen height so that the platen clears the gauge by .030." Move the gauge to the opposite end of the machine and repeat the procedure. Check for a parallel condition by sliding the gauge back to the beginning end. With the gauge removed, the platen height adjustment should now be refined to provide even top and bottom color of printed characters.

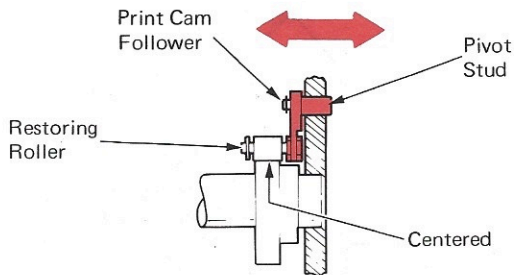
CAUTION: Any change in the front-to-rear position of the platen necessitates a readjustment of the velocity control plate and anvil on early level machines. Also, any change in the platen position may alter the paper feed adjustments. All paper feed adjustments should be checked and readjusted if necessary.

NOTE: On single pitch machines the rear of the platen gauge must be held up against the bottom of the escapement rack. On dual pitch machines the platen gauge must be held down against the escapement rail while making this adjustment.



8. **Print Cam Follower (Level 1)** – The print cam follower must be adjusted to satisfy the following conditions:

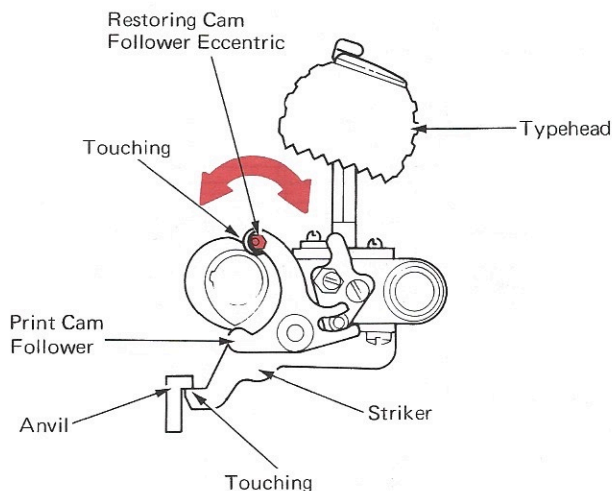
- a. **Print Cam Follower Stud** – Adjust the pivot stud left-to-right so the rubber roller on the follower is centered on the surface of the restoring cam. The stud is held in place in the carrier casting by a setscrew that is accessible from the bottom of the machine.



(Top View)

- b. **Restoring Cam Follower Eccentric** – With the print cam follower at the high point of the cam and the platen removed, hold the typehead toward the rear until it is restricted by the anvil and striker. The roller should just touch the restoring cam. Adjust the eccentric, keeping the high point forward, to satisfy this condition.

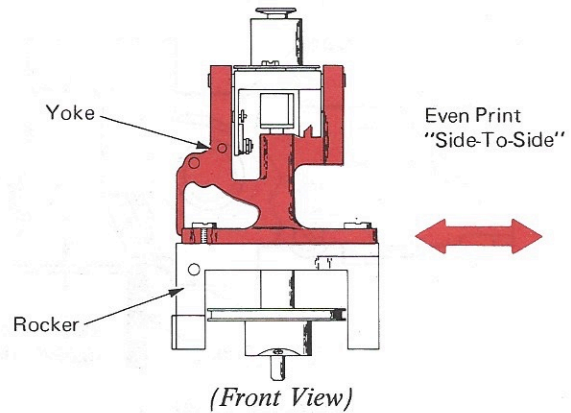
NOTE: If the roller is too close to the restoring cam, it may bind against the cam during print shaft rotation. If too much clearance exists, the typehead may not be restored as quickly as is necessary and blurred characters may result.



(Right Side View)

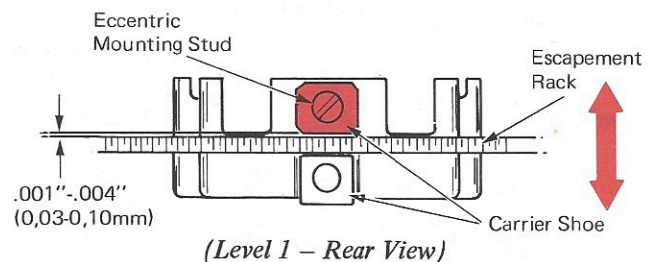
9. **Yoke** – Position the yoke rotationally under its mounting screws so the density of the left and right sides of a printed character is uniform.

This adjustment will affect the tilt ring homing adjustment, the typehead homing adjustment and skirt clearance. Be sure to check these adjustments after changing the position of the yoke.

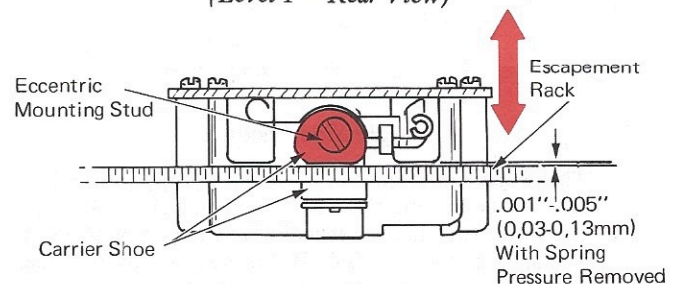


(Front View)

10. **Carrier Shoe** – Adjust the level 1 carrier shoe eccentric mounting stud to obtain .001"-.004" vertical play between the carrier shoes and the escapement rack. The level 2 carriers equipped with the spring loaded carrier shoe should be adjusted for .001"-.005" of vertical movement with the spring pressure removed. This adjustment should be checked at several points along the escapement rack.

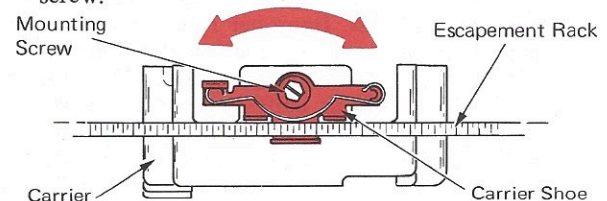


(Level 1 – Rear View)



(Level 2 – Rear View)

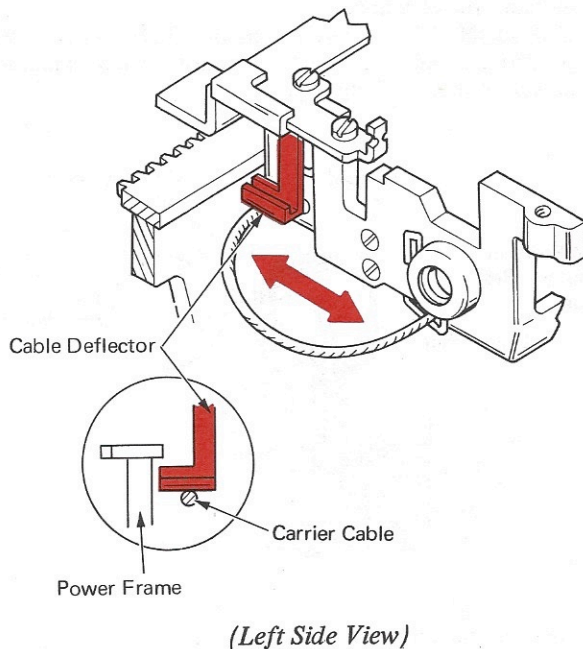
Level 3 Parallel – Loosen mounting screw on carrier shoe. Press down firmly on rear of carrier, keeping carrier shoe parallel with escapement rack, tighten screw.



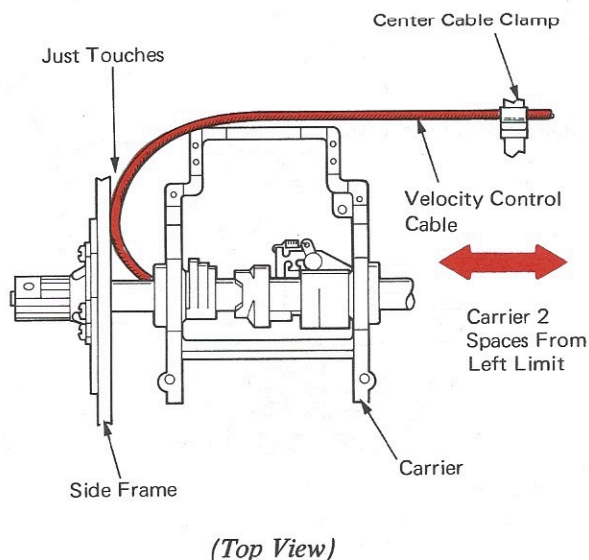
(Level 3 – Rear View)

NOTE: On dual pitch machines ensure that the escapement pawl is centered in the escapement rack teeth.

14. **Carrier Cable Deflector** – Form the deflector to the rear as far as possible without touching the power frame.

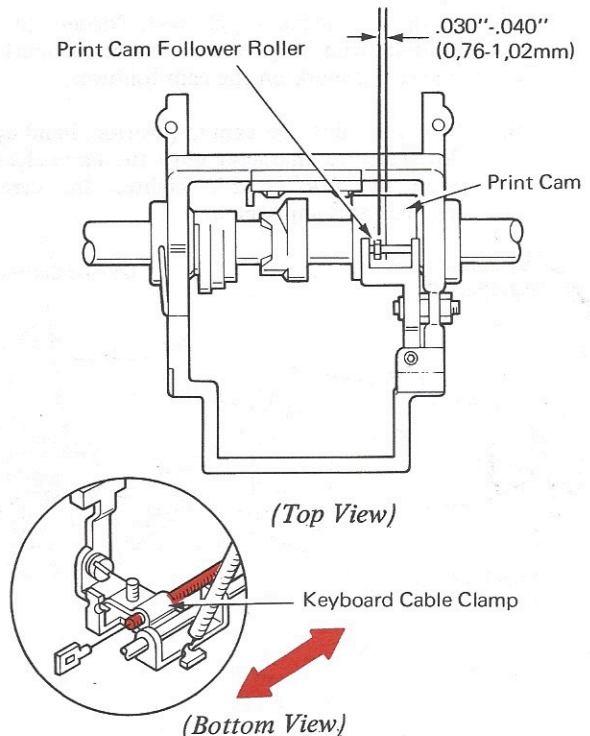


15. **Center Cable Clamp** – Position the cable sheath left-to-right within the center cable clamp so the bend in the cable will just touch the machine left-hand side frame when the carrier is resting two spaces from the extreme left-hand margin. This adjustment allows the carrier to operate freely along the entire writing line and allows the velocity control cable to operate with a minimum of flexing.

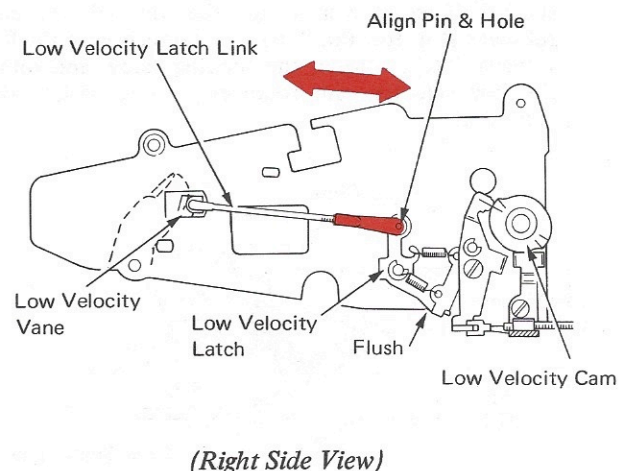


16. **Velocity Control Keyboard Cable Clamp** – Adjust the cable sheath front-to-rear under the clamp so the print cam follower roller will shift onto the low velocity lobe of the print cam by the width of the roller plus .030"-.040" when a low velocity character is half cycled. Moving the cable sheath to the rear will produce more motion to the roller.

This adjustment should be checked by observing the track of the roller in the grease on the print cam.



17. **Low Velocity Latch Link** – With the machine at rest, the low velocity latch link should be adjusted to just span the distance between the low velocity vane and the low velocity latch. This adjustment ensures the latch will take a full bite on the follower and there will be no lost motion in the system.



PAPER FEED AND INDEX OPERATIONAL THEORY

The purpose of the paper feed and index mechanism is to hold the paper firmly against the platen so that it will move with the platen as it is indexed vertically.

The paper feed mechanism uses an “A frame” for support and contains all the parts necessary to control paper feed.

The paper is held against the platen by the front and rear feed roll assemblies located beneath the platen. Each feed roll assembly contains three or four rubber rollers equally spaced along the feed roll shaft and molded to the shaft.

The feed rolls mount in the front and rear feed roll arm assemblies. Each feed roll arm assembly pivots on a pivot stud at the rear of the "A frame." Heavy extension springs, connected between the "A frame" and feed roll arm assemblies, supply constant tension on the feed rolls. There are several notches cut into the feed roll arm assemblies to provide a means of adjusting the feed roll pressure.

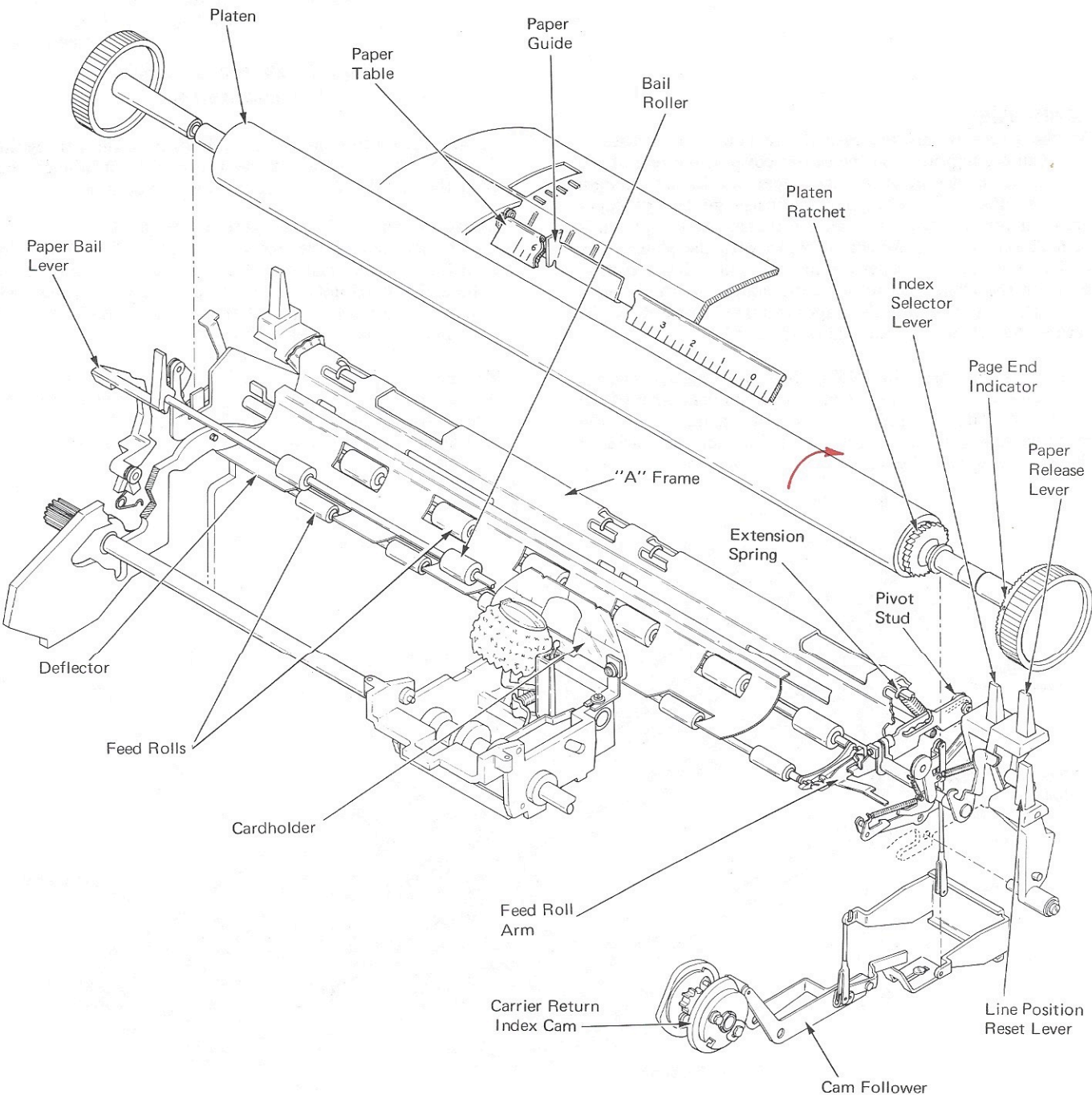


Figure 1 – Paper Feed And Index

PAPER RELEASE

The pressure of the feed rolls can be released from the platen to allow the operator to position the paper more accurately and to allow easier insertion and removal of the paper (Figure 4). Paper release is accomplished by pulling forward on the paper release lever located at the right end of the machine. The front of the paper release lever cams the feed roll release arm forward to rotate the feed roll actuating shaft. The feed roll release levers are clamped to the feed roll actuating shaft and has a lug resting on each feed roll tension arm. As the shaft rotates, the feed roll release levers rotate the feed roll tension arms, moving the feed rolls away from the platen. When the paper release lever has been pulled all the way forward, the end of the feed roll release arm detents to hold the feed roll release lever in the released position.

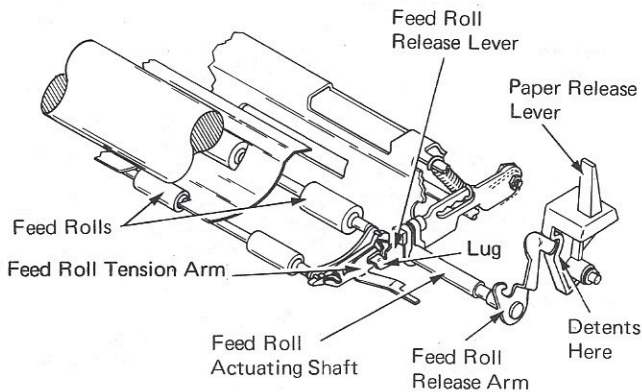


Figure 4 - Paper Release Mechanism
(Released Position)

MACHINES EQUIPPED WITH TIE ROD SUPPORT

Paper release is accomplished by pulling forward on the paper release lever located at the right end of the machine (Figure 5). The front of the paper release lever cams the feed roll release arm forward to rotate the feed roll actuating shaft. The feed roll release levers are clamped to the feed roll actuating shaft and rest behind a lug on each feed roll tension arm. As the shaft rotates, the feed roll release levers rotate the feed roll tension arms and the front feed roll arms down, away from the platen. Due to the interconnection between the front feed roll arm and the rear feed roll arm, the rear feed roll arms are forced away from the platen. When the paper release lever has been pulled all the way forward, the end of the feed roll release arm detents to hold the feed roll release lever in the released position.

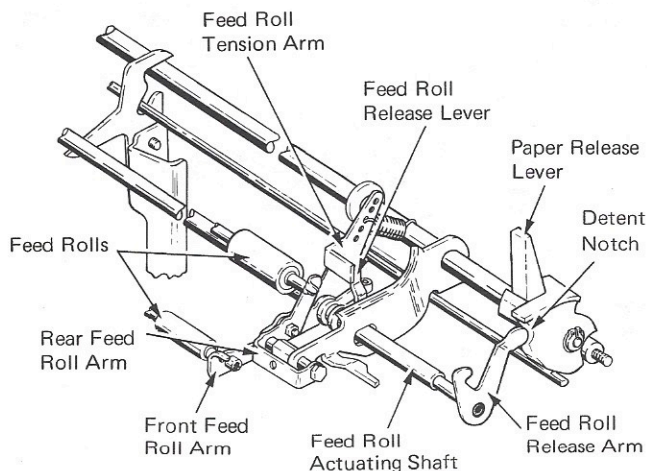


Figure 5 - Paper Release
(Released Position)

INDEX MECHANISM

The index mechanism operates to line space the paper vertically. An index operation can be obtained by depressing either the carrier return keylever or the index keylever. Depressing the carrier return keylever also causes the carrier to move to the left margin, whereas depressing the index keylever causes only an index operation. The index selector lever may be positioned so the mechanism will line space either one or two lines during each operation. With the lever in the forward position, single line spacing will occur. The mechanism will double line space if the lever is to the rear. Indexing is achieved by a pawl which engages and rotates a ratchet on the right end of the platen (Figure 6). The ratchet is locked to the platen so the platen will rotate also.

Motion to operate the index mechanism is supplied through the carrier return/index cam. Motion is then transferred through the cam follower.

From the cam follower, motion is transferred through the multiplying lever and the index link. The rear of the multiplying lever is always in contact with the multiplying lever stop which is attached to the power frame. The index link will receive the same amount of motion each time the cam operates, regardless of the position of the index selector lever.

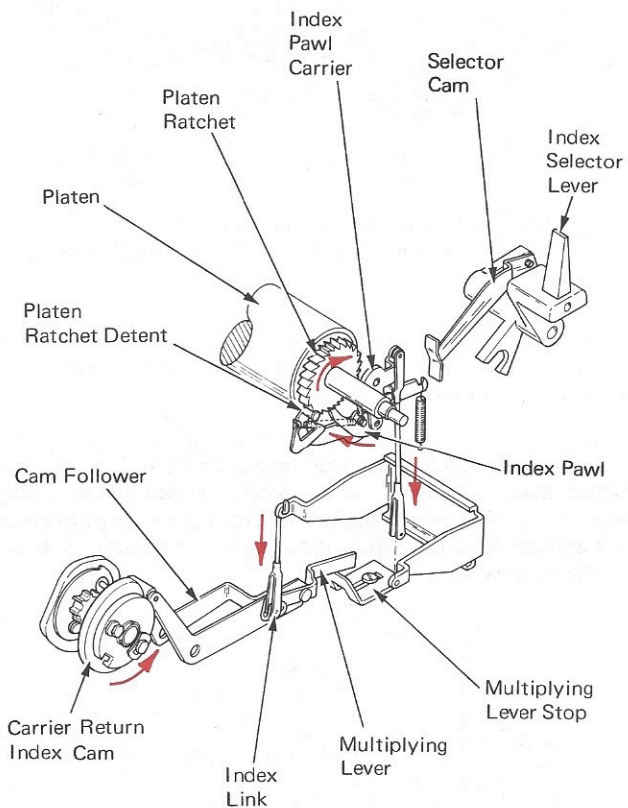


Figure 6 - Index Operation

PLATEN VARIABLE

The platen variable mechanism provides the operator with a means of rotating the platen to a position other than the normal writing line (Figure 11). The platen variable is used for typing permanently above or below the writing line or locating the writing line after reinserting the paper. The platen ratchet must remain stationary when selecting a new writing line so that the detent roller will be seated between the two teeth of the ratchet at the new position. A clutch mechanism connects the ratchet to the platen so that it can be engaged for line spacing and disengaged by pushing the left-hand platen knob toward the right. As long as the platen knob is held to the right, the platen can be rotated freely while the ratchet remains stationary. When the knob is released, the clutch is automatically reengaged by spring tension.

When the driver is disengaged from the platen end plug, the platen can be turned to the desired position. The driver can then engage different serrations and lock the platen in the new position. The left-hand platen knob is mounted to a shaft that slides left-to-right inside the platen. A light compression spring holds the shaft toward the right to prevent free play. The shaft pushes against the platen driver. Movement of the platen knob toward the right is transferred to the driver to disengage it from the platen end plug.

The left side of the platen ratchet contains two pins that fit into holes in the platen driver. The platen driver operates left-to-right and always turns with the ratchet. A compression spring between the ratchet and the driver loads the driver to the left so the serrations on the outer surface of the driver mesh with matching serrations inside the platen end plug. The meshing of the serrations causes the platen, the driver and the ratchet to be locked together and turn as a unit.

PAGE END INDICATOR

The page end indicator (Figure 11) located on the right-hand platen knob allows the operator to judge the typed distance down the page. It is calibrated in half inches. The operator must align the top edge of the paper with the writing line on the cardholder. For a standard size sheet of paper, the operator must rotate the indicator until position 2 is in line with the horizontal mark on the top of the typewriter adjacent to the right platen knob. When using other than standard 11" paper, the operator may locate the indicator setting from the page indicator chart in her operator manual.

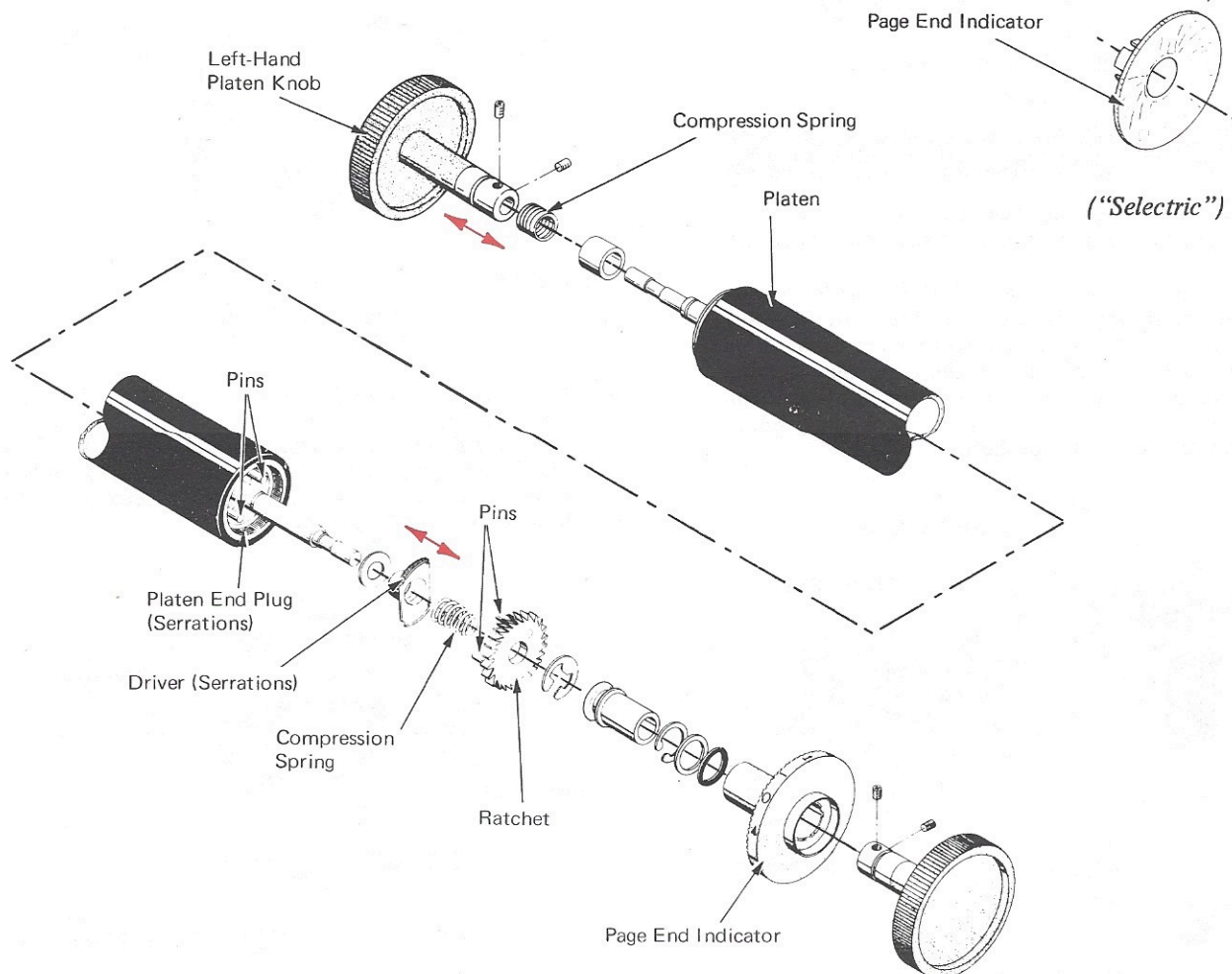
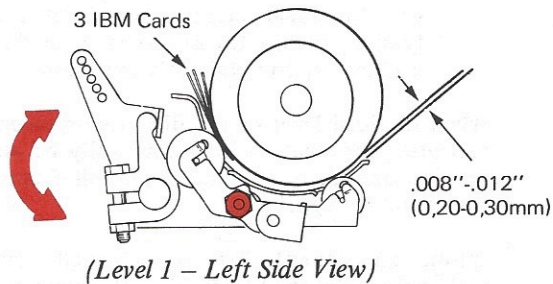


Figure 11 – Platen Variable And Page End Indicator
(“Selectric” II)

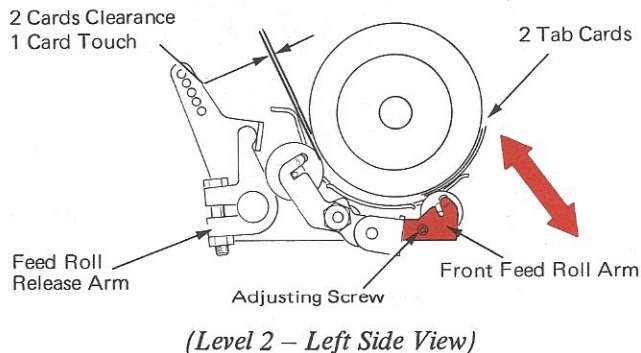
4. Feed Roll Arms (Level 1 & 2) –

- a. Adjust the feed roll arms to obtain .008"-.012" clearance between the front feed rolls and the platen when three tab cards are inserted between the rear feed rolls and the platen.

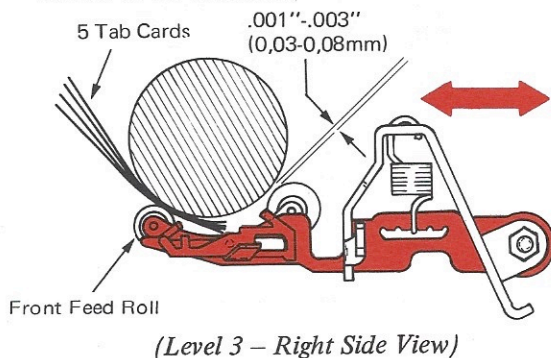


- b. Adjust the front feed roll arms vertically to obtain a slight clearance between the rear feed rollers and the platen when two tab cards are between the front feed rollers and the platen. With one tab card between the front feed rollers and the platen, the rear feed rollers should have a slight drag on the platen.

An easy method to make this adjustment is as follows: Remove the paper deflector and insert three tab cards between the rear feed rollers and the platen. Loosen the adjusting screw. While pressing the front feed roll arm toward the platen, tighten the adjusting screw. Do the same for the opposite end. Then check for the above adjustment. The feed roll release arms must not restrict the feed roll arms.

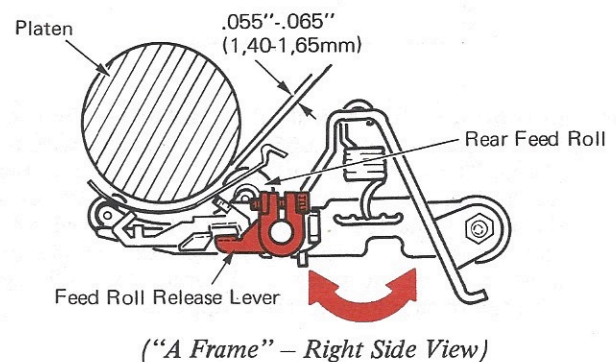
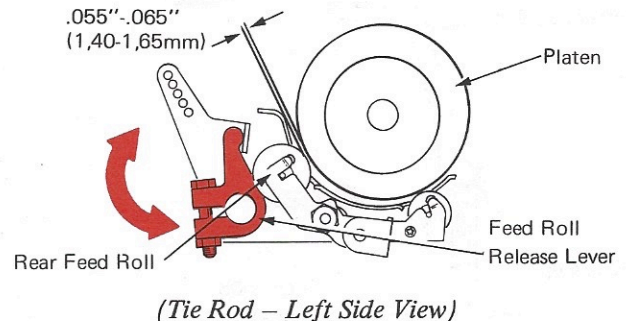


Feed Roll Arms ("A Frame" Only) – Adjust the feed roll arms front-to-rear so a clearance of .001"-.003" exists between the rear feed roll and the platen with five tab cards (.035"-.037") between the platen and all the front feed rolls. With the cards removed, there should be no clearance.

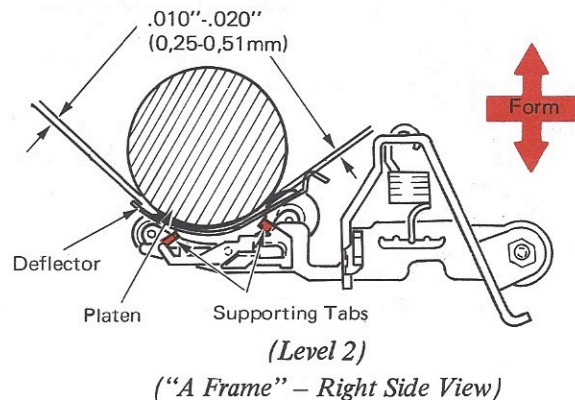
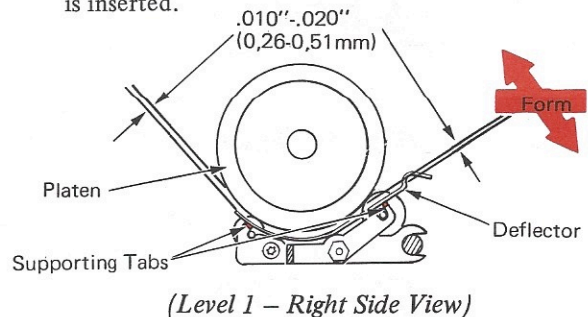


5. **Paper Release** – Adjust the feed roll release levers front-to-rear to obtain .055"-.065" clearance between the rear feed rollers and the platen when the feed rollers are released.

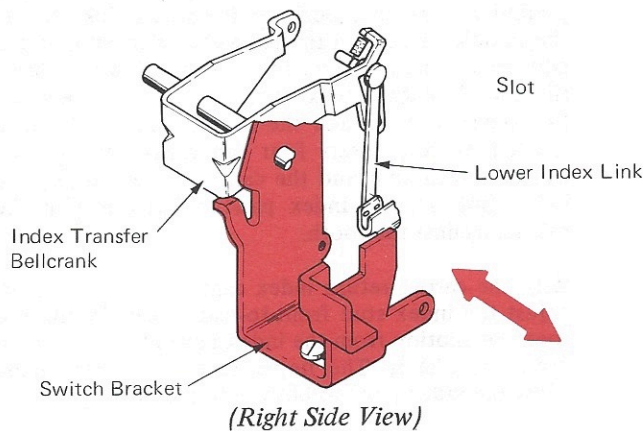
Excessive clearance can cause interference between the front feed roll and the carrier, whereas insufficient clearance will not permit straightening of thick paper packs.



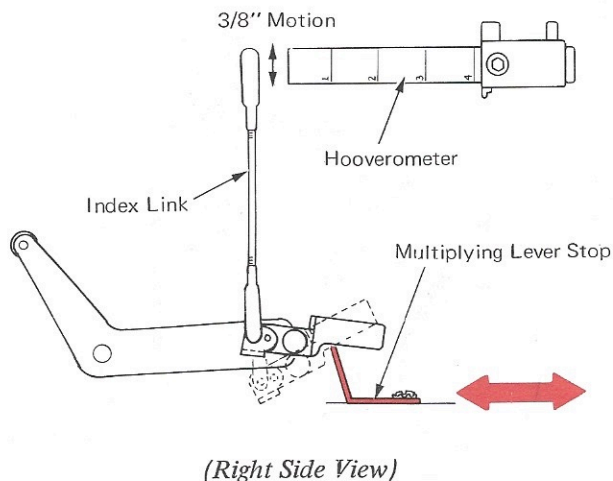
6. **Deflector** – Form the deflector supporting tabs on the front and rear feed roll arms to obtain a clearance of .010"-.020" between the deflector and the platen. Three tab cards inserted between the platen and the deflector, at the front and rear, should provide a slight drag. No drag should be felt when one tab card is inserted.



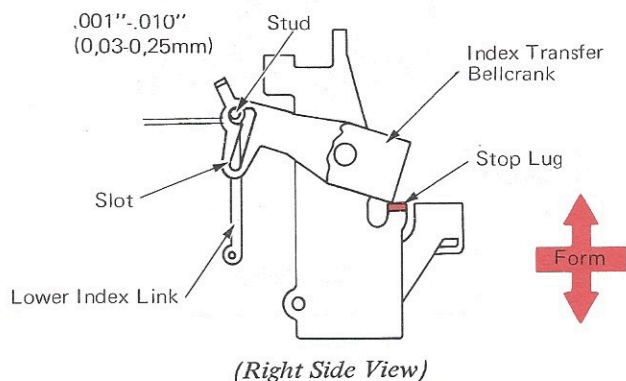
10. **Switch Bracket** – Adjust the switch bracket left or right to ensure that the lower index link does not bind in the slot in the index transfer bellcrank.



11. **Multiplying Lever Stop** – Adjust the multiplying lever stop front-to-rear to produce 3/8" motion to the index link when the carrier return index cam is operated to its high point (platen removed).



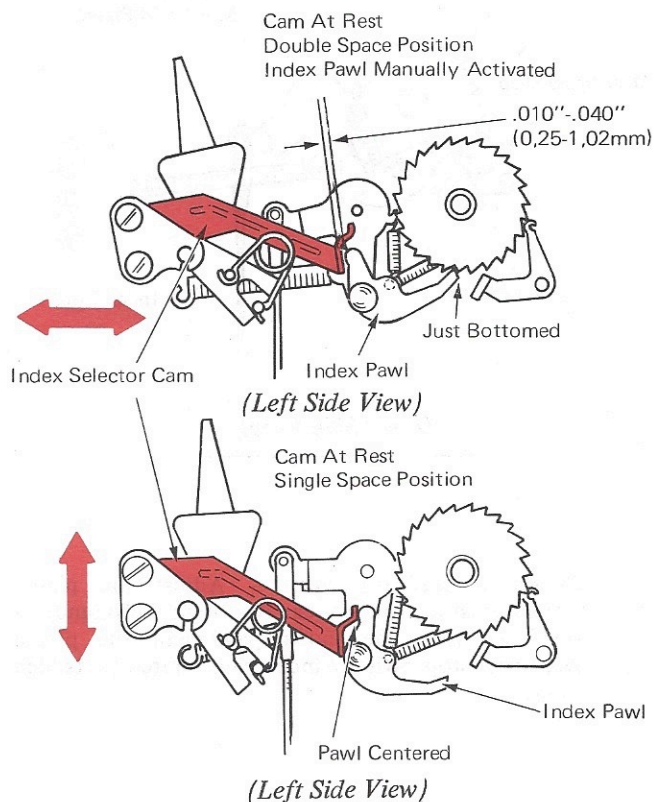
12. **Index Transfer Bellcrank Stop Lug (Rotary Backspace Only)** – Form the index transfer bellcrank stop lug for a .001"-.010" clearance between the stud on the lower index link and the lower horizontal edge of the slot in the index transfer bellcrank. This will ensure that the lower index link stud reliably restores to the front of the slot after a backspace operation.



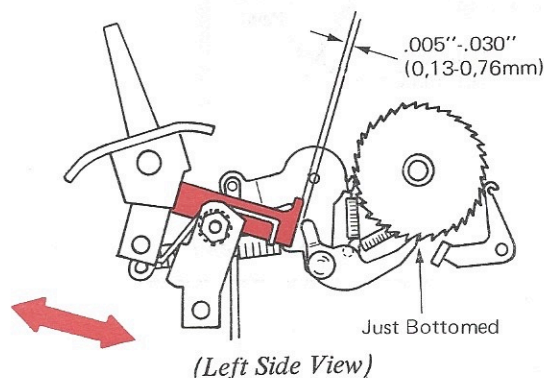
13. **Index Selector Cam 27-Tooth Ratchet** – With the index lever in the double space position, press down on the index link until the index pawl is just bottomed in a ratchet tooth. Adjust the index selector cam so a clearance of .010"-.040" can be observed between the working surface of the selector cam and the rear tip of the index pawl.

With the index lever in the single space position, adjust the selector cam vertically so the index pawl is centered on the cam surface.

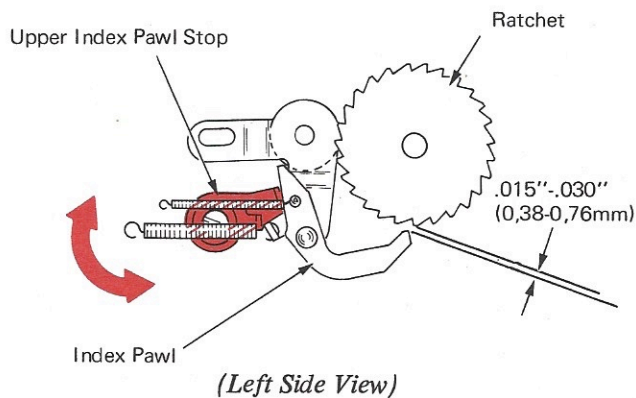
These adjustments must be considered together and refined until both are correct.



- Index Selector Cam 54-Tooth Ratchet** – With the index lever in double space, press down on the index link until the index pawl is just bottomed in a ratchet tooth. Adjust the index selector cam so a clearance of .005"-.030" can be observed between the working surface of the selector cam and the rear tip of the index pawl.



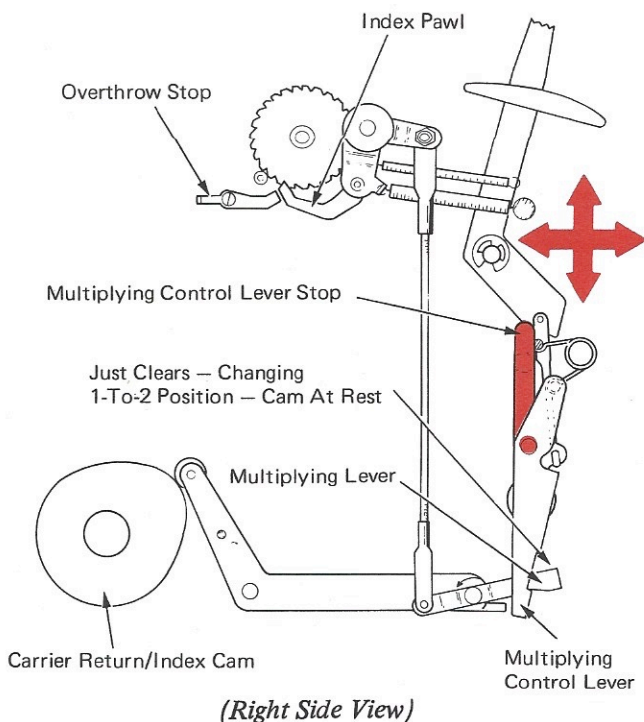
17. **Upper Index Pawl Stop (Level 1)** – With the index cam latched at rest, adjust the upper index pawl stop to obtain .015"-.030" clearance between the index pawl and the platen ratchet.



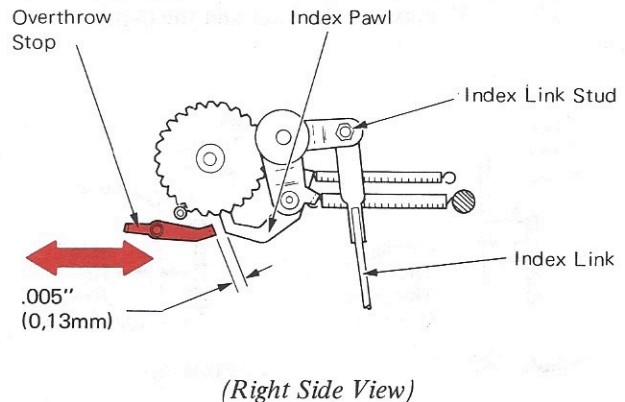
18. **Multiplying Control Lever (Level 1)** – Position the multiplying control lever stop front-to-rear so the elongated hole is centered on its mounting stud. This is a preliminary adjustment and may need to be changed slightly.

Adjust the multiplying control lever vertically to just clear the bottom edge of the multiplying lever with the carrier return index cam at rest. Keep the high point of the eccentric toward the front of the machine.

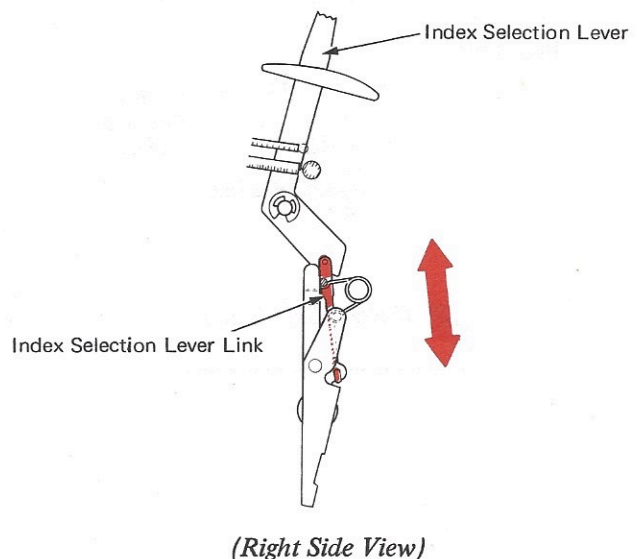
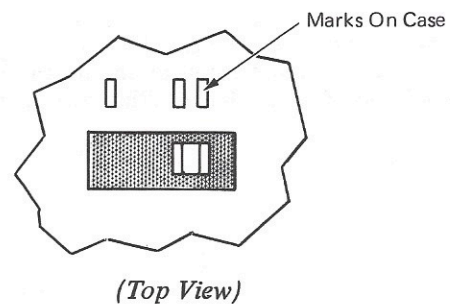
Adjust the multiplying control lever stop front-to-rear to obtain two full teeth of motion from the index pawl after it begins to drive the platen. Be sure that the index motion is not choked off with the platen overthrow stop.



19. **Platen Overthrow Stop (Level 1)** – Adjust the platen overthrow stop front-to-rear to obtain a clearance of .005" between the index pawl and the platen overthrow stop with the index cam rotated to its high point.



20. **Index Selection Lever** – Adjust the index selection lever link so that the index selection lever aligns with the double mark on the case when the lever is in double space position.



FILM RIBBON OPERATIONAL THEORY

The purpose of the Film Ribbon Mechanism is to lift the ribbon into the path of the typehead during a print operation; and to feed the ribbon from the supply spool to the take-up spool.

The film ribbon mechanism mounts on and moves with the carrier assembly. The supply spool of ribbon mounts on a permanent supply spool on the left side of the carrier. Due to the inner-connection between the plastic core of the supply spool and the permanent supply spool, both spools rotate as a unit during a ribbon feed operation. As the ribbon comes from the supply spool, it threads around the ribbon circuit to the take-up spool. The take-up spool is a disposable, transparent spool mounted on the right side of the carrier. Once the ribbon has been used and fed to the take-up spool, both the take-up spool and the plastic core from the supply side are removed and discarded. The new ribbon to be installed comes equipped with its own take-up spool fastened to the end of a clean leader (Figure 1).

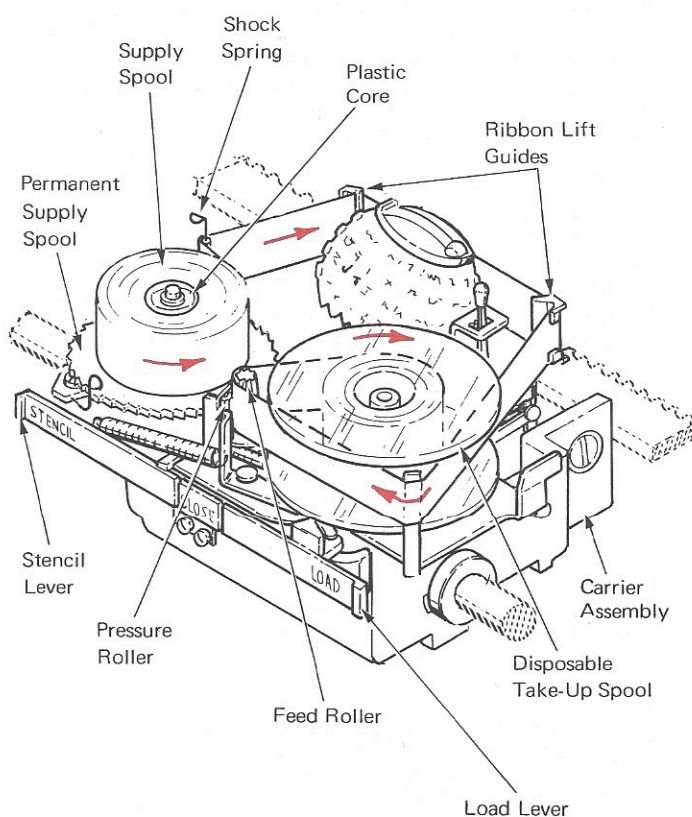


Figure 1 - Film Ribbon Mechanism

RIBBON FEED

The ribbon feed cam, which is keyed to the print sleeve, supplies the motion for ribbon feed. The motion from the cam is transmitted through an adjustable stud to the cam follower, which drives the feed pawl (Figure 2). The cam follower mounts on a bracket that is fastened to the front carrier casting by two hex-headed screw. An extension spring, anchored to one of these screws, loads the cam follower against the cam. The feed pawl mounts at the top of the cam follower by a shouldered rivet and is spring loaded into engagement with the ribbon feed and lift wheel.

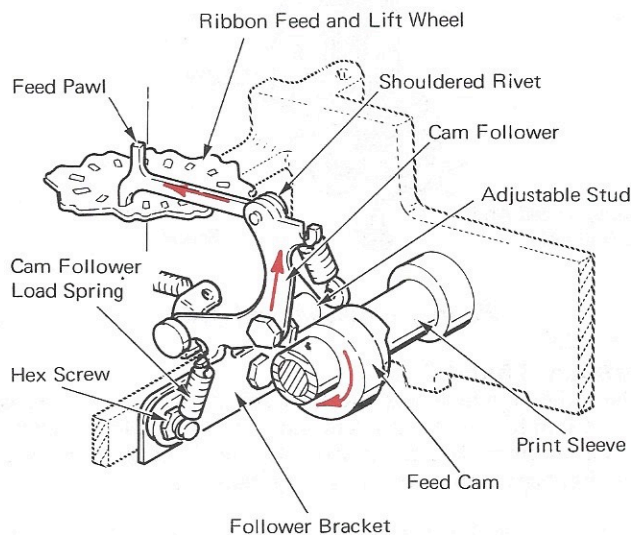


Figure 2 - Ribbon Feed Mechanism
(Half Cycle Position)

The ribbon feed and lift wheel contains sixteen feed windows laid out in a circular pattern (Figure 3). During the first half of a print cycle, the cam follower will ride to the low point of the feed cam under spring tension. The feed pawl attached to the top of the cam follower will move to the rear camming out of one window and dropping into the next. As the feed cam follower and feed pawl are powered forward, the feed and lift wheel will be rotated clockwise. The wheel will rotate one window during each print cycle.

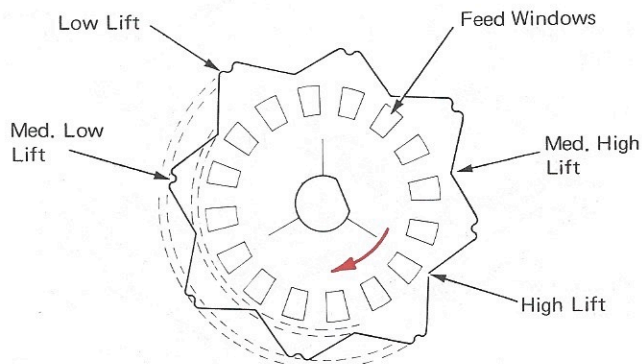


Figure 3 - Ribbon Feed & Lift Wheel
(Top View)

The four lift positions obtained by moving the control link are designated by "A", "B", "C" and "D" (Figure 8A).

Positions "A" and "C" are low lift positions while "B" and "D" are high lift positions. These four lift positions occur in a definite order during a typing operation. It takes four print operations to complete a lift cycle, which is from "A" to "B" to "C" to "D." On the fifth print operation, the lift cycle begins all over again with lift position "A." Changing the location of the lift control link in the slot of the cam follower produces these lift positions.

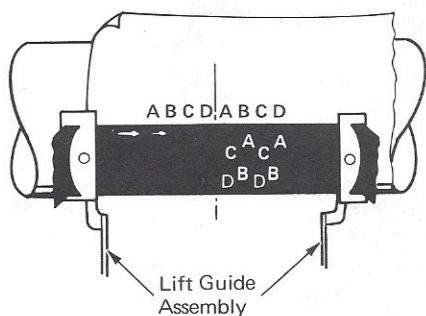


Figure 8A – Typed Sample

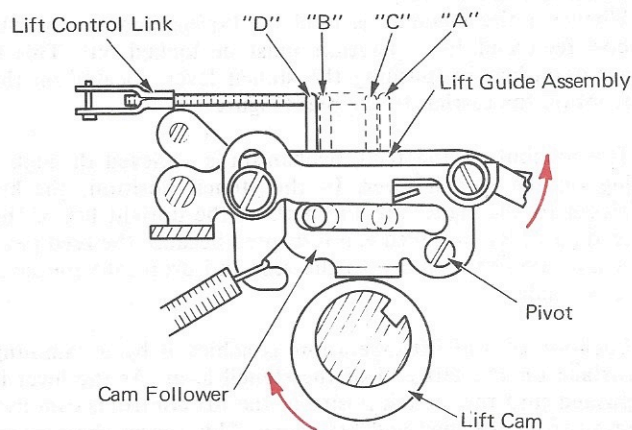


Figure 8C – Ribbon Lift Positions (Right Side View)

The motion produced by the camming lobes on the ribbon feed and lift wheel is transmitted to the lift control link by the ribbon lift control lever. The lift control lever is mounted to the front of the carrier by a shouldered screw and is spring loaded against the camming lobes of the feed and lift wheel. During the early portion of a print cycle, the feed and lift wheel tends to rotate backwards with the feed pawl. This happens because the feed pawl is cammed out of the feed window as it travels toward the rear of the machine. To prevent the feed and lift wheel from rotating backwards, the ribbon lift control lever serves to detent the feed and lift wheel. This is accomplished by a detent notch cut on the high lobes of the ribbon feed and lift wheel (Figure 9).

The selected ribbon lift position for each print operation is always established by the ribbon feed operation from the previous print cycle. This is because the rotation of the feed and lift wheel does not occur until after the typehead has printed.

The different lift positions are determined by the ribbon feed and lift wheel. The camming lobes on the perimeter of the wheel govern the position of the lift control link during each ribbon feed operation. These lobes which correspond to each feed window produce the four lift positions in a consecutive order as the wheel rotates 1/16 of a turn for each ribbon feed operation (Figures 8B & 8C).

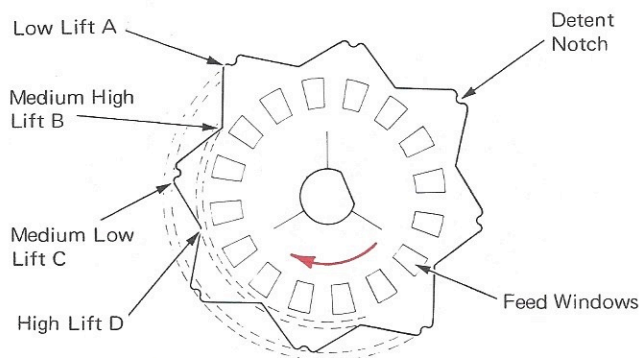


Figure 8B – Ribbon Feed And Lift Wheel (Top View)

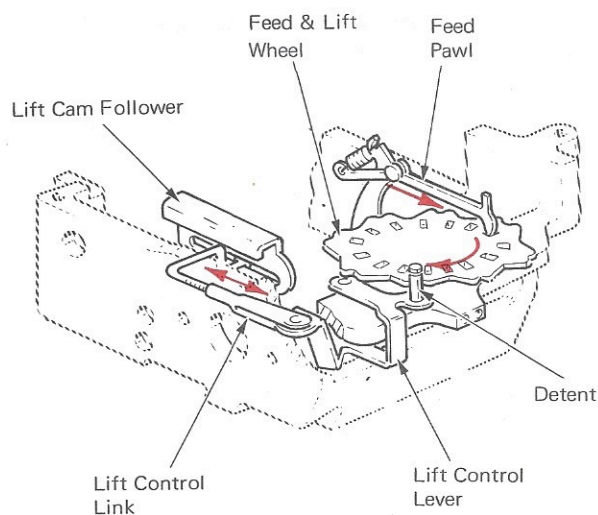


Figure 9 – Lift Control Lever

RIBBON FEED

During a feed operation the supply spool brake is mechanically disengaged by the ribbon lift mechanism (Figure 13). The upper extension of the lift guide plate contacts the brake actuating lever when the lift guide is in the raised position. As the brake actuating lever pivots about its pivot point, it cams the supply spool brake out of engagement with the supply spool.

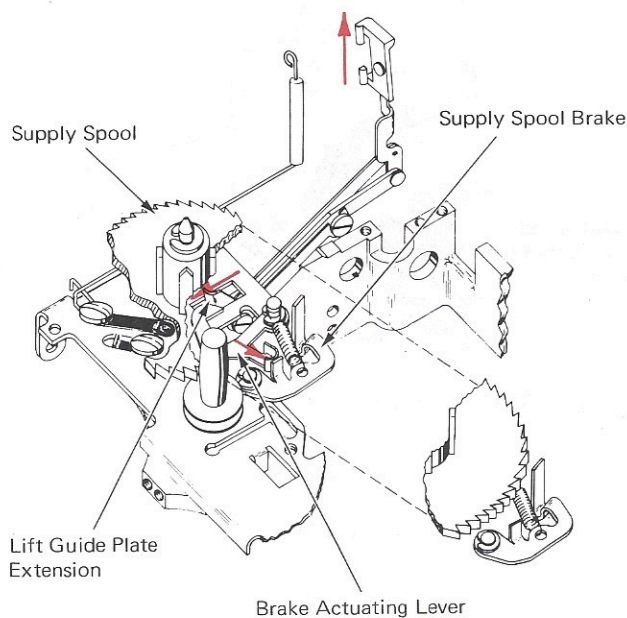


Figure 13 – Ribbon Shock Spring And Brake Actuating Lever (Level 1)

To prevent the ribbon feed and lift wheel from rotating backward during a feed operation, a detent spring rides in the feed windows of the ribbon feed and lift wheel (Figure 14).

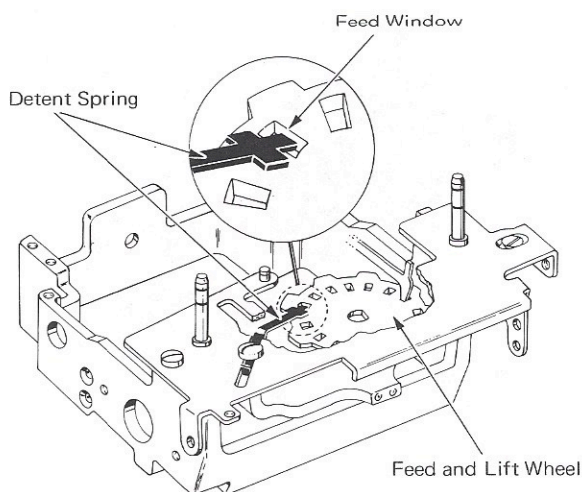


Figure 14 – Feed & Lift Wheel Detent Spring (Level 1)

STENCIL LOCKOUT

In the stencil position, the feed pawl shield is rotated beneath the feed pawl to prevent the feed pawl from operating in the feed windows (Figure 15). Lockout of the lift mechanism is achieved in the same manner as the present mechanism. However, the parts design is slightly different.

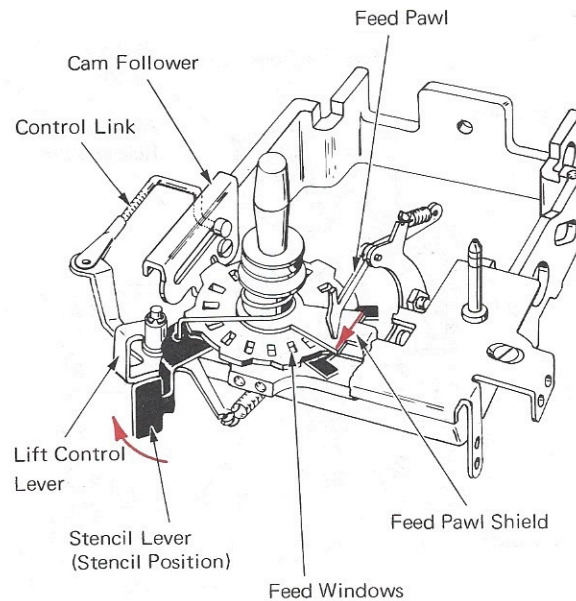


Figure 15 – Stencil Lockout (Level 1)

RIBBON LOAD

The ribbon load operation is initiated by a ribbon load bail (Figure 16). A link is connected between the ribbon load bail and the load lever. The load lever raises the lift guide assembly in the same manner as the current load lever.

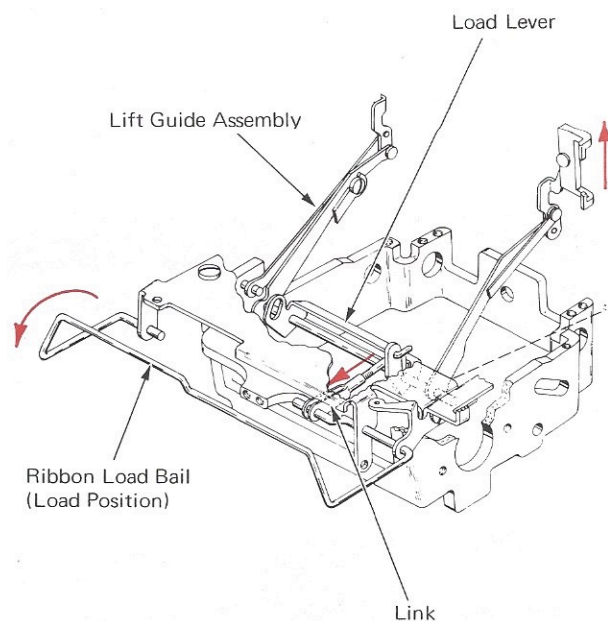
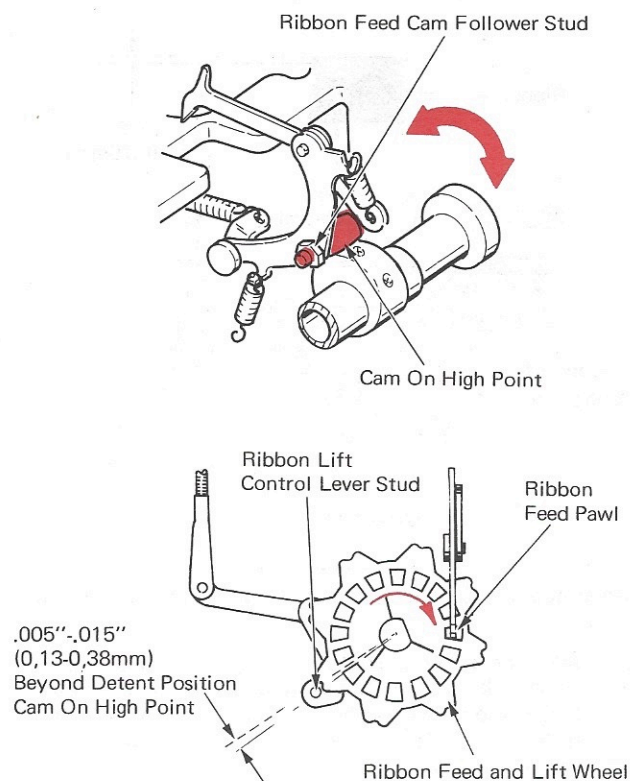


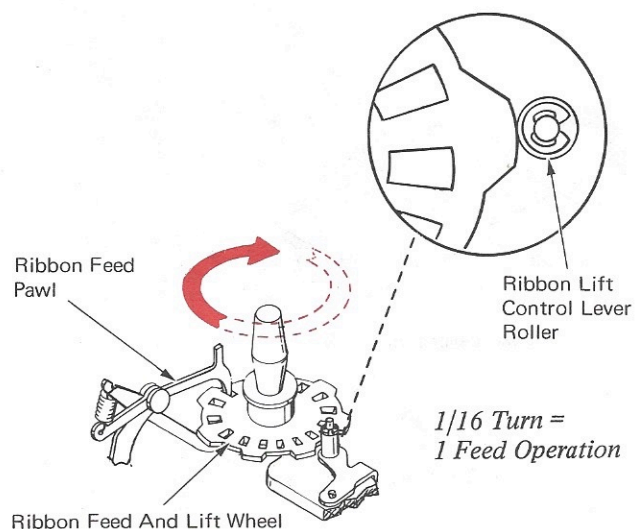
Figure 16 – Ribbon Load Operation (Level 1)

4. **Ribbon Feed Cam Follower Stud (Level 2)** – Hand cycle the machine and observe the lift control lever stud as it moves from the low point to the high point on the ribbon feed and lift wheel. Adjust the ribbon feed cam follower stud so the ribbon lift control lever stud overthrows the detent notch in the ribbon feed and lift wheel by .005"-.015."

(Level 1) – Machines not equipped with the detented positions on the ribbon feed and lift wheel should be adjusted so the lift control lever roller is centered on the high dwell of the ribbon feed and lift wheel.

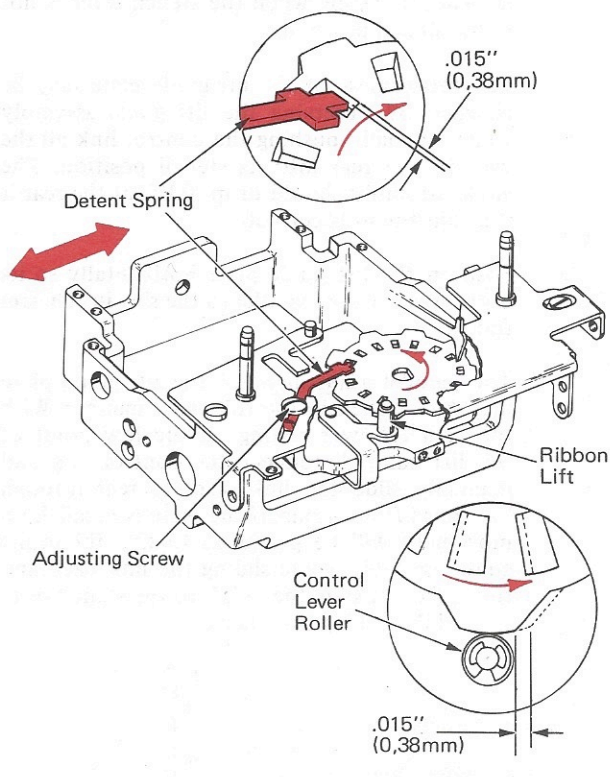


(Level 2 – Top View)

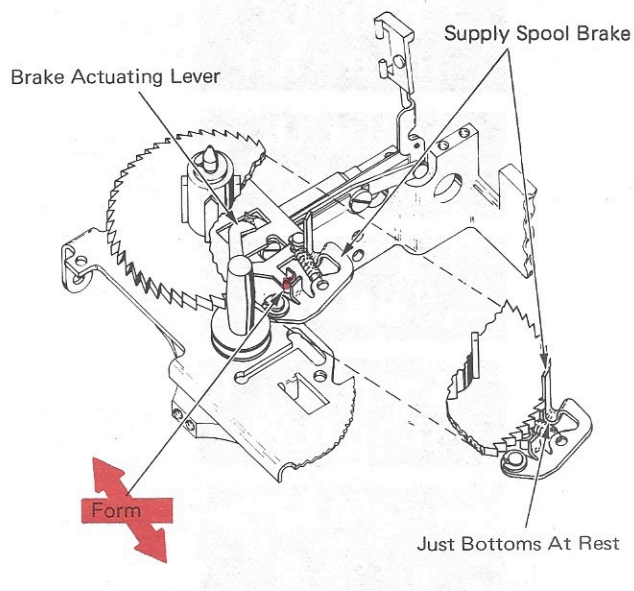


(Level 1 – Top View)

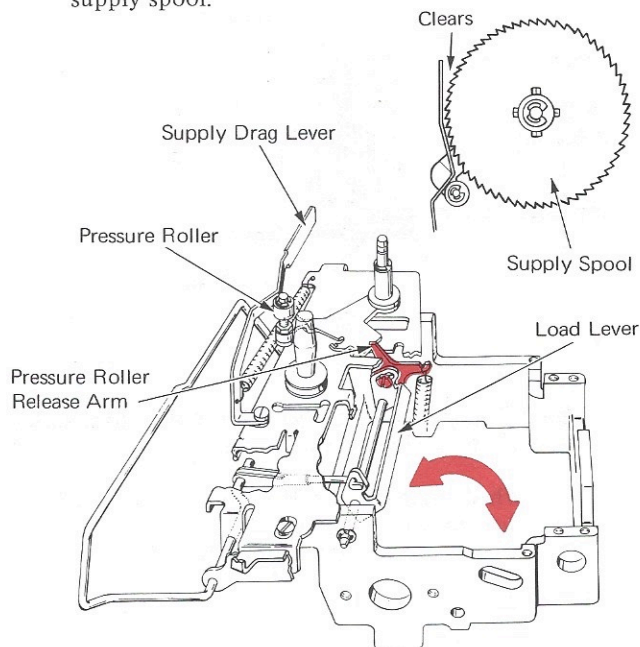
5. **Ribbon Feed and Lift Wheel Detent Spring (Level 1 Only)** – Hand cycle the machine and observe the ribbon feed and lift wheel detent spring as the ribbon lift control lever roller moves from the low point to the high point on the ribbon feed and lift wheel. The ribbon feed and lift wheel should travel .015" after the detent spring drops into a feed window.



6. **Brake Actuating Lever (Level 1 Machines Only)** – Form the lug on the brake actuating lever so the supply spool brake is allowed to just bottom in the ratchet teeth of the supply spool when the machine is at rest.



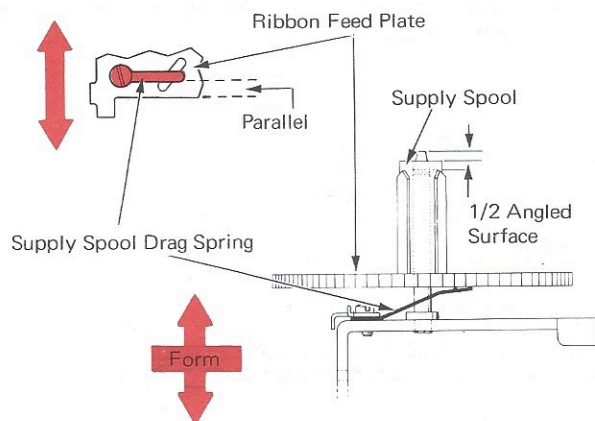
10. **Pressure Roller Release Arm (Level 1)** – Adjust the pressure roller release arm beneath its binding screw, located on the left end of the load lever, so the supply drag lever will be pushed forward by the pressure roller to just clear the front edge of the supply spool.



(Level 1)

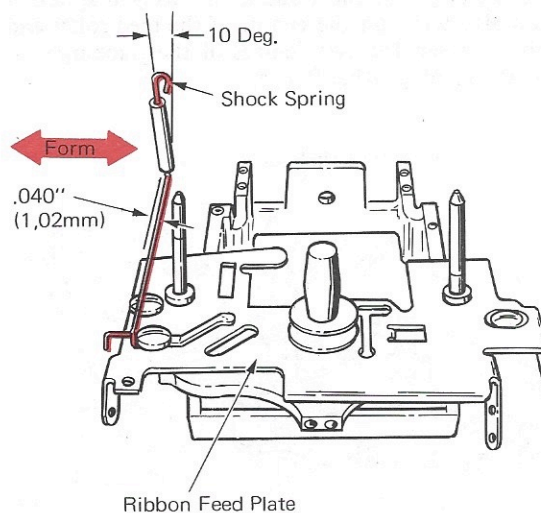
11. **Supply Spool Drag Spring (Level 1)** – Adjust the supply spool drag spring to satisfy the following conditions:

- Position the drag spring parallel to the front edge of the ribbon feed plate.
- With the "C" clip removed, the drag spring should raise the supply spool so half of the angled surface on top of the pivot stud is protruding above the top face of the spool. Form the drag spring up or down to obtain this condition.



(Level 1 – Front View)

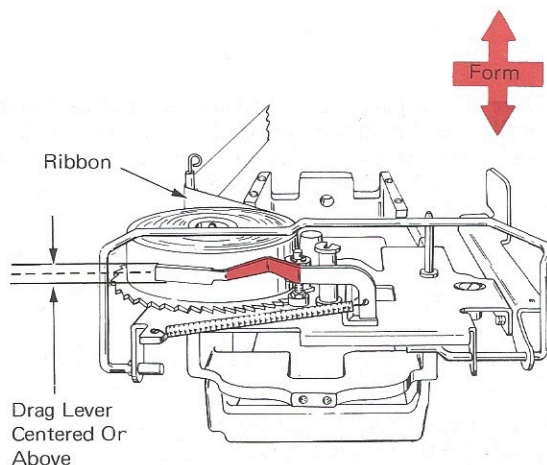
12. **Shock Spring (Level 1)** – Position the shock spring so it is approximately .040" to the right and parallel to the edge of the ribbon feed plate. The shock spring should be formed to make the roller on the shock spring lean 10 deg. to the left.



(Level 1 – Front View)

13. **Drag Lever (Level 1)** – The supply spool drag lever must contact the outer wrap of the ribbon on the supply spool at the center or slightly above. Form the lever to obtain this condition. Do not form it front to rear.

NOTE: After forming the lever make sure that it does not bind on its pivot screw. If the supply spool drag lever contacts the ribbon below center, the outer wraps of the ribbon spool will tend to creep up which may cause ribbon spillage.



(Level 1 – Front View)

The fabric ribbon mechanism can be divided into two separate mechanisms. They are the ribbon lift mechanism and the ribbon feed mechanism. The ribbon lift raises the ribbon to the printing position before the typehead prints and then restores the ribbon to allow a visible writing line. The ribbon feed moves the ribbon laterally past the printing point to provide an unused portion for the next typing operation. Included in the ribbon feed mechanism is the ribbon reversing mechanism which changes the feeding direction when either end of the ribbon is reached.

The ribbon is a 9/16" fabric ribbon enclosed in a disposable cartridge unit for clean handling. The cartridge unit contains two spools on which the ribbon is wound. The ribbon is constantly fed from one spool to the other and back again. Once the ink supply has been depleted, the cartridge is simply snapped off, discarded and a new cartridge is installed (Figure 1).

Located to the right of the pointer on the carrier assembly is the ribbon load lever. When this lever is pushed to the right, it forces the ribbon lift guide into an extreme lift position for convenience of changing the ribbon. This load lever is detented to hold the ribbon lift in the high lift position. The cartridge is then removed from the ribbon feed plate and the ribbon can be easily removed from the guide without touching the ribbon.

A new ribbon can be installed by reversing the above procedure. Tapered lugs on the sides of the ribbon feed ratchets automatically guide the ribbon spools into the correct position. Guide lugs at each side of the feed plate maintain the lateral position of the cartridge. Retainer springs attached to the guide lugs hold the cartridge down to prevent vibration. After the ribbon is installed, the load lever is moved back to the left to allow the ribbon to restore to its normal position for a typing operation.

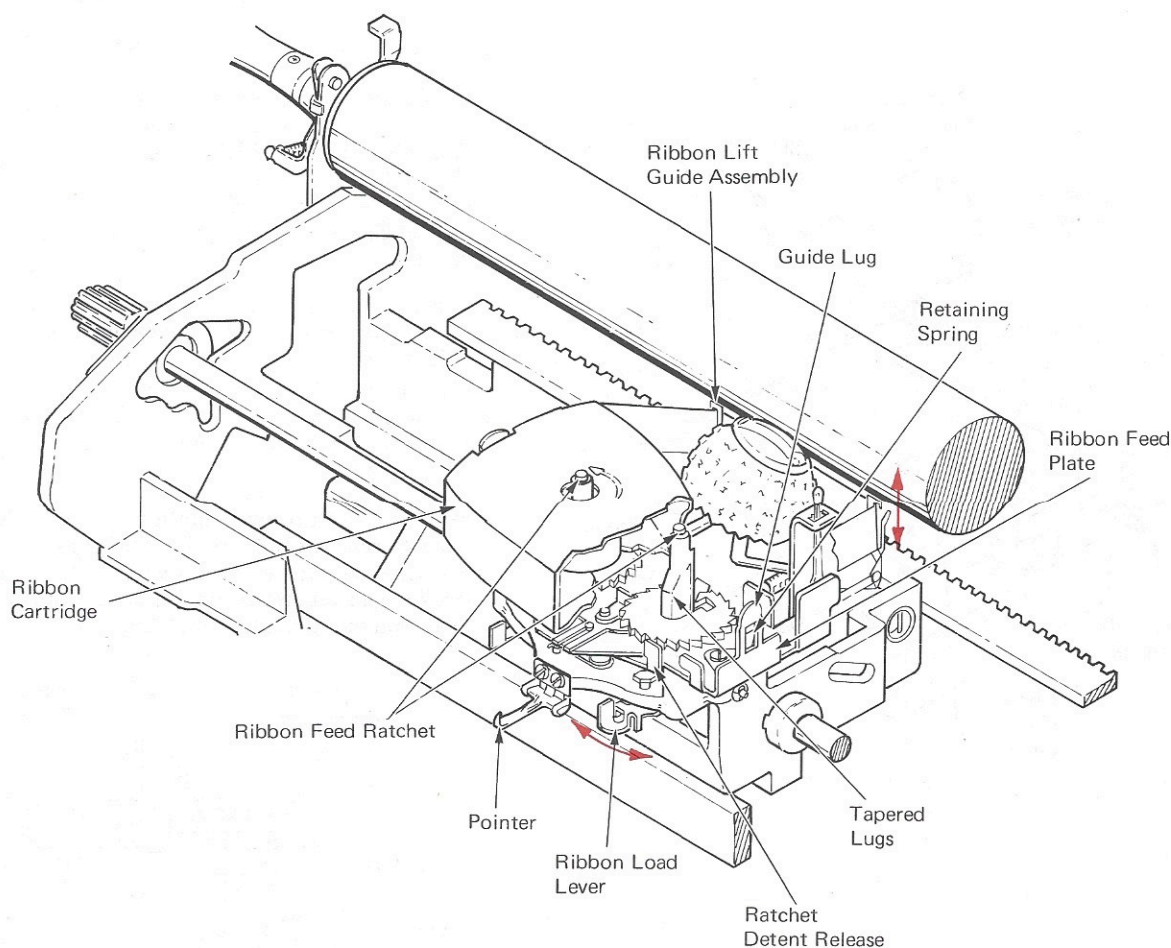


Figure 1 – Carrier Assembly (Fabric Ribbon Installed)

The ribbon feed ratchet assemblies rotate freely around their respective feed ratchet spindles. The ribbon feed ratchet is designed to center the ribbon supply hub within the ribbon cartridge and lock it in place radially so that when the ribbon feed pawl moves a ratchet, the supply spool will also move. Two flat retainer springs are mounted on the ribbon feed plate at the rear so that they rest against the ribbon feed ratchets. The slight drag applied by the springs prevents the jerk of the ribbon feed operation from spinning the supply spool and spilling off excessive ribbon (Figure 5).

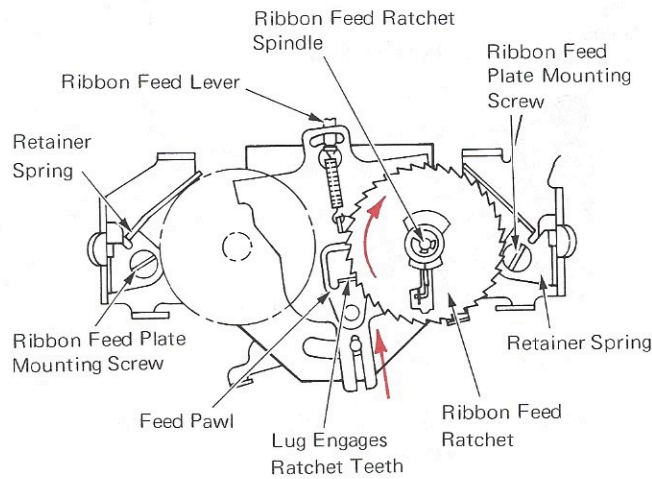


*Figure 5 – Ribbon Feed Operation
(Top View)*

RIBBON REVERSE OPERATION

Each feed ratchet contains a small bellcrank called the ribbon reverse trigger (Figure 6). This trigger is spring loaded down by a small flat reverse trigger spring. The reverse trigger is held within the ribbon feed ratchet in the inactive position as long as ribbon is around the spool. During the last revolution of the supply spool, the reverse trigger is released into the active position. This causes the lower extension of the reverse trigger to drop into the path of a notch in the feed and reverse plate.

On the forward or restoring stroke of the plate, the reverse trigger restricts one side of the plate from sliding forward. The other side continues to slide forward, thereby causing a pivoting action to the entire plate about the point of restriction. This makes the front of the plate pivot toward the opposite side, positioning the feed pawl in line with the ratchet teeth of the ribbon feed ratchet containing the empty ribbon spool. On the next feed stroke, the feed pawl will engage the ratchet teeth of the empty spool, causing it to begin to take on ribbon (Figure 6).

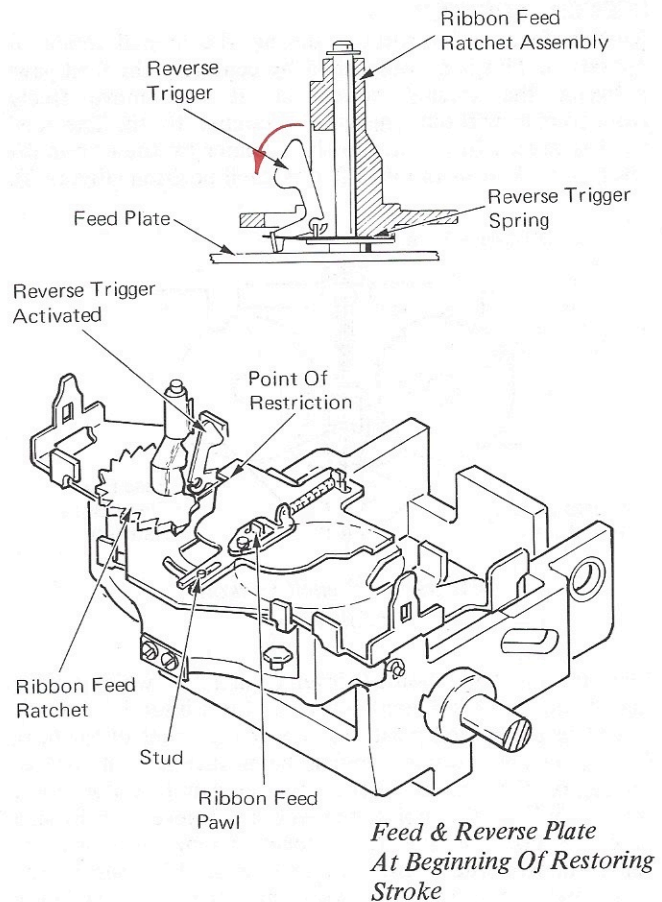


Figure 6 – Ribbon Reverse

Since the reversing action makes the "full" take-up spool become the supply spool and the "empty" supply spool become the take-up spool, it is necessary to disengage the ratchet detent lever from one feed ratchet and engage it with the other. This is done in step with the reversing operation. As the front of the feed and reverse plate swings, causing the feed pawl to engage with the opposite feed ratchet, it pivots the ratchet detent lever to the opposite spool. A stud riveted to the lever protrudes up through a slot in the feed and reversing plate linking the two together. A hairpin spring, fastened to this stud and anchored to the feed plate, provides a toggling action to both the feed and reverse plate and the ratchet detent lever. In addition, the hairpin spring keeps the ratchet detent lever constantly spring loaded against the teeth of the feeding ratchet (Figure 7).

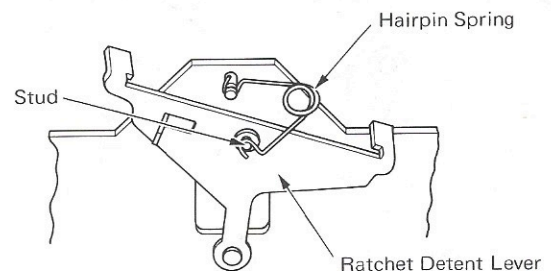


*Figure 7 – Ratchet Detent
(Bottom View)*

The ribbon feed pawl is powered to the rear by the action of the ribbon feed cam. A sliding cam follower transfers the motion of the cam to the ribbon feed bellcrank which pivots and actuates the feed pawl to the rear. Sufficient motion is available from the cam to cause two teeth to feed on the ratchet.

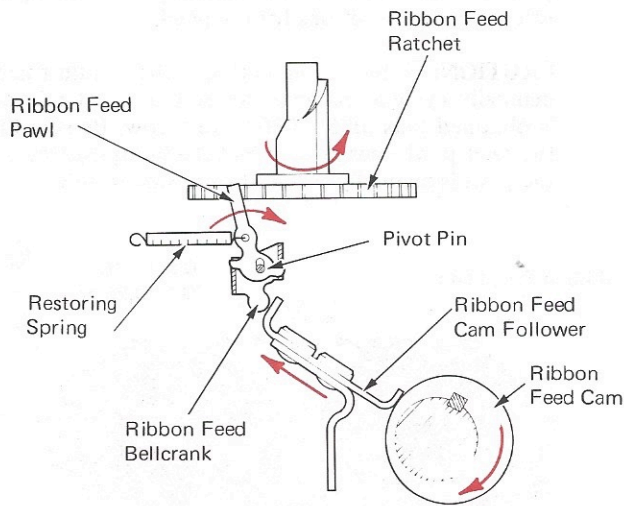


*Figure 12 – Ribbon Feed Cam Motion
(Right Side View)*

As the feed pawl restores to the front, it slides along the teeth of the ratchet into the rest position (Figure 13). The drag of the pawl along the teeth tends to rotate the ratchet backwards and unwind the ribbon. To prevent any backward rotation, a detent pawl is spring loaded into the teeth of the ratchet to allow feed in one direction only.

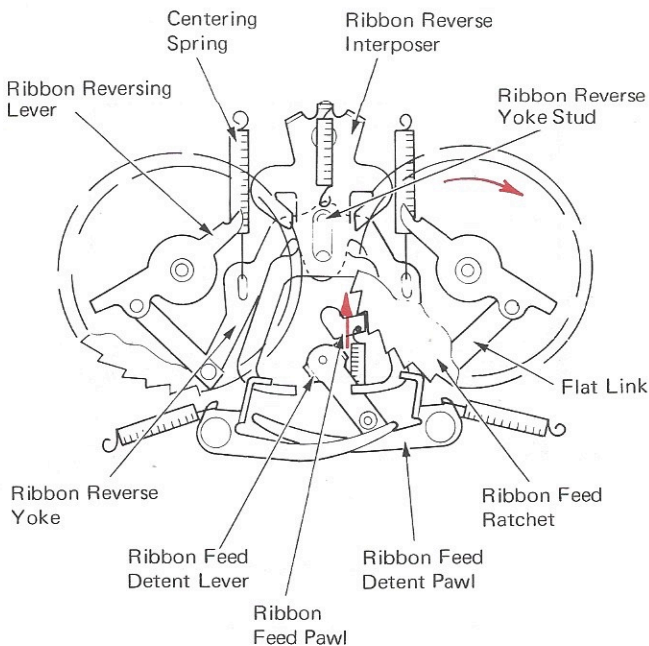


Figure 13 – Ribbon Feed Pawl (Rest Position – Top View)

LEVEL 1 REVERSE

To reverse the ribbon, a portion of the reverse trigger pivots down through a hole in the ratchet into position below the ratchet as it does in the current mechanism (Figure 14). The empty spool rotates slightly farther, causing the reverse trigger to contact and actuate the reverse lever which pivots just below the ratchet. The reverse lever is connected by means of a flat link, to an arm of the reverse yoke beneath the ribbon feed plate. The yoke is pivoted by operation of the reverse lever. A stud on the yoke at the rear of the pivot point extends up through the feed plate into a slot in the reverse interposer. Movement of the yoke positions the front of the reverse interposer left or right depending upon which ribbon spool is being emptied.

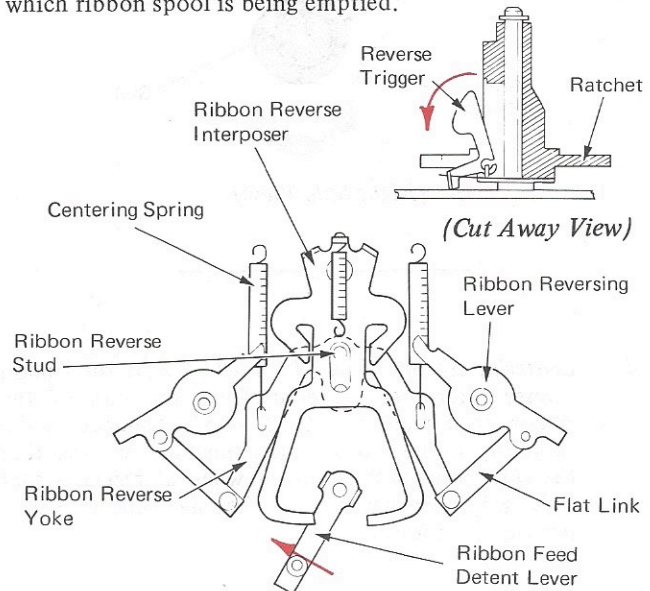


Figure 14 – Ribbon Reverse Mechanism (Top View)

Two things occur when the reverse interposer is positioned. A hook at the front of the interposer hooks around a lug on the ribbon feed detent lever (Figure 16). The interposer lever, mounted on the interposer, is positioned into the path of the ribbon feed pawl. The next operation of the ribbon feed cam causes the feed pawl to drive the reverse interposer to the rear. The hook at the front of the interposer pulls the lug of the detent lever to the rear causing the detent lever to pivot to the opposite position.

As the feed pawl restores, its spring pivots it over into engagement with the opposite ratchet.

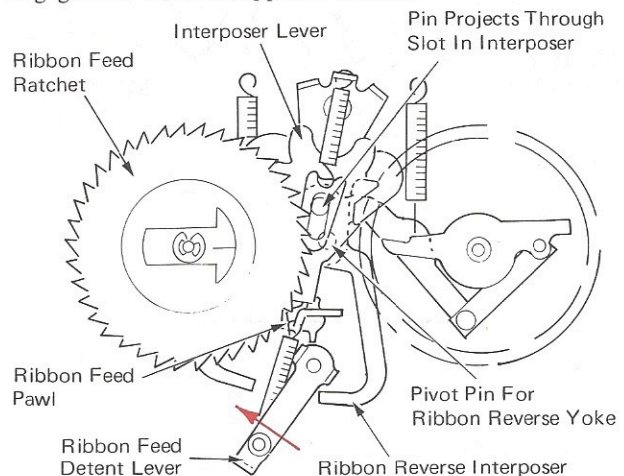
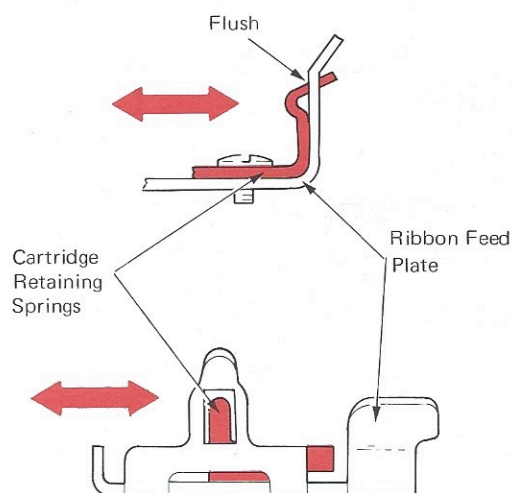


*Figure 15 – Ribbon Reverse Mechanism
(Active Position – Top View)*

5. *Cartridge Retaining Springs (Level 2 Only)* – The cartridge retaining springs should be positioned laterally so they are **FLUSH** against the feed plate; then adjust front-to-rear so the cartridge retaining fingers are centered in the holes of the cartridge guide lugs. The ratchet brake portion of the spring should exert a small drag on the feed ratchet. Form only as necessary.

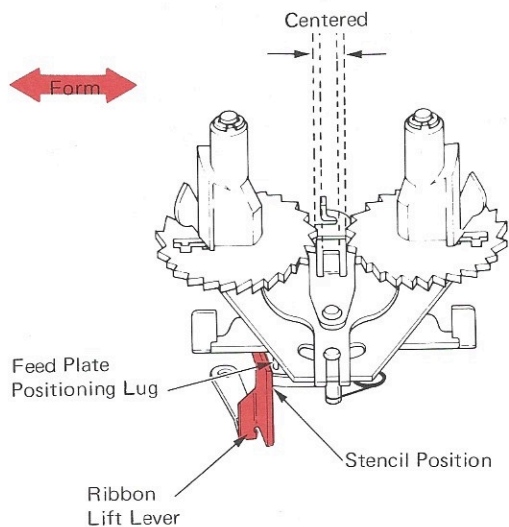
NOTE: Excessive or insufficient tension could result in reverse failure.



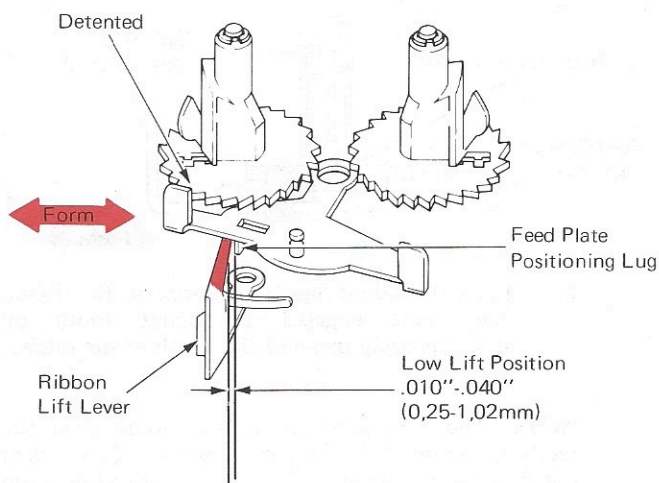
(Right Side View)

6. *Ribbon Lift Lever (Level 2 Only)* – Three conditions must be met as follows:

- a. Form the ribbon lift lever finger tab left or right so the ribbon feed pawl will center between the two feed ratchets when the lift lever is placed in stencil position.

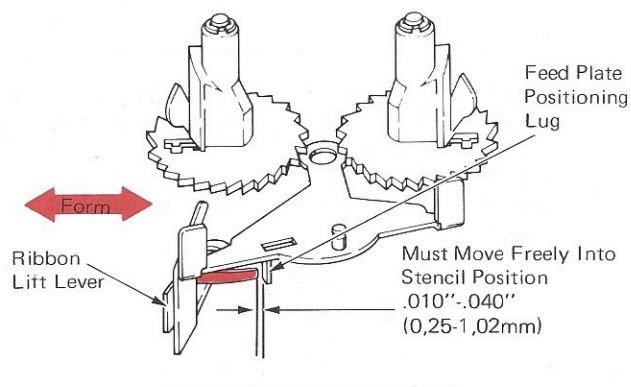


- b. Form the rear lug so a clearance of .010"-.040" exists between the lug and feed plate positioning lug when the **LEFT RATCHET IS FEEDING**.



- c. Form the front lug so a clearance of .010"-.040" exists between the lug and the feed plate positioning lug when the **RIGHT RATCHET IS FEEDING**.

NOTE: Avoid forming the ribbon feed plate positioning lug, since breakage would require replacement of the entire feed plate.

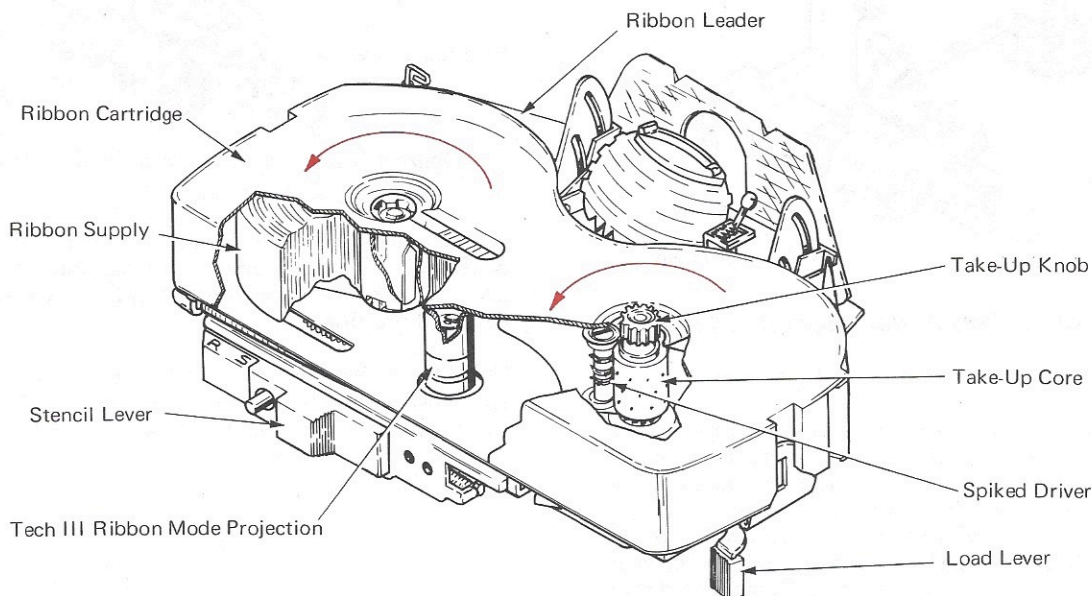


SELECTIVE RIBBON OPERATIONAL THEORY

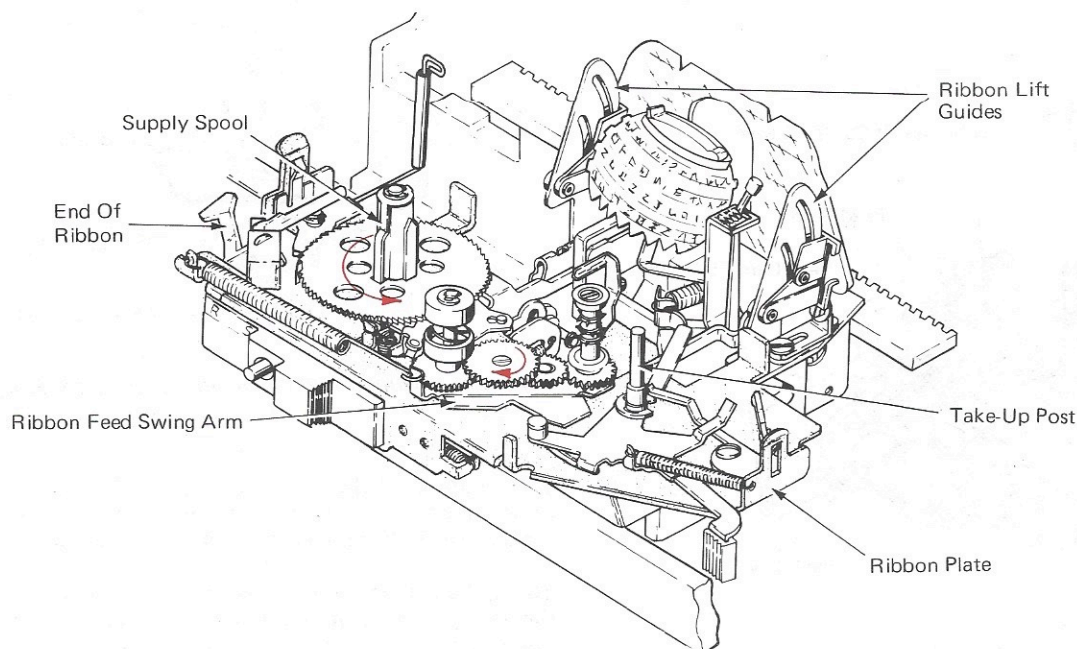
The purpose of the selective ribbon system is to operate with the film ribbon, the IBM Tech III ribbon or the IBM Correctable Film Ribbon. All three of these ribbons are contained in a cartridge, similar in appearance to the "Selectric" Typewriter fabric ribbon cartridge, but considerably larger. The complete supply of ribbon is in the left side of the cartridge. The used ribbon will be wound around the take-up core on the right side and the cartridge will be discarded when the ribbon is used up. The cartridges for the three types of ribbons look the same but have different color take-up knobs and leaders for identification; blue for IBM Tech III, cerise (pink) for film and yellow for the IBM Correctable Film Ribbon (Figure 1).

The feed modes for the IBM Correctable Film Ribbon and film ribbon are the same, but the feed mode for the IBM Tech III ribbon differs completely. The film ribbons must be fed so that no characters overlap, whereas the IBM Tech III ribbon is fed in much smaller increments so as to use the overstrike capabilities of this ribbon. The inner construction of the cartridge determines in which ribbon feed mode the mechanism will operate.

A ribbon lift pattern of three tracks is used for all three of the ribbons. However, the IBM Tech III ribbon lift is wobbled (varied) slightly to maintain even color.



(View With Cartridge Installed)



(Viewed With Cartridge Removed)

Figure 1 – Selective Ribbon System

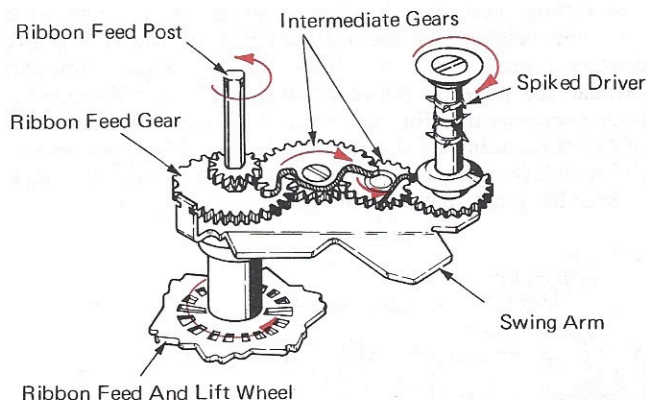


Figure 6 – Spiked Driver Rotation

The free end of the swing arm is heavily spring loaded toward the ribbon take-up post. This causes the spikes of the spiked driver to dig into the used ribbon. When the spiked driver rotates, it causes the take-up core to rotate about the take-up post, winding up the used ribbon and pulling new ribbon into the print position (Figure 7).

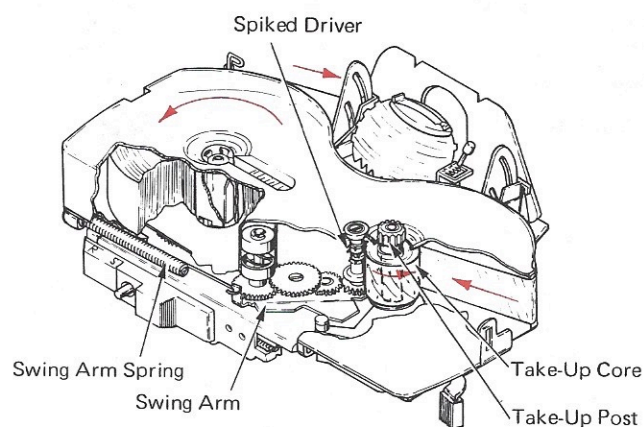


Figure 7 – Ribbon Feed Operation

FILM RIBBON MODE

The different feed increments for the two ribbon modes are controlled by the amount of spiked driver rotation for each print cycle.

The ribbon feed gear is free to slide vertically on the ribbon feed post. Its vertical position determines the amount of spiked driver rotation. In the film ribbon mode, the ribbon feed gear is spring loaded upward by the feed gear spring allowing its large gear to engage the small gear of the first intermediate gear. This causes the spiked driver to rotate a sufficient amount to feed film ribbon so the characters do not overlap (Figure 8).

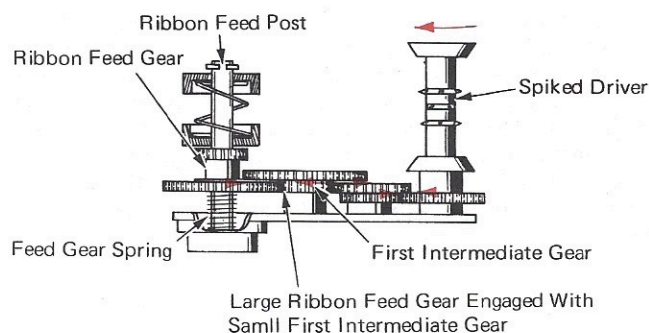


Figure 8 – Film Ribbon Mode

IBM TECH III RIBBON MODE

In the IBM Tech III ribbon mode, a projection within the cartridge depresses the ribbon mode button which, through a compression spring, depresses and holds down the ribbon feed gear. This allows the small gear on the ribbon feed gear to engage the large gear of the first intermediate gear and causes the spiked driver to rotate approximately 1/6 the amount as in the film ribbon mode (Figure 9).

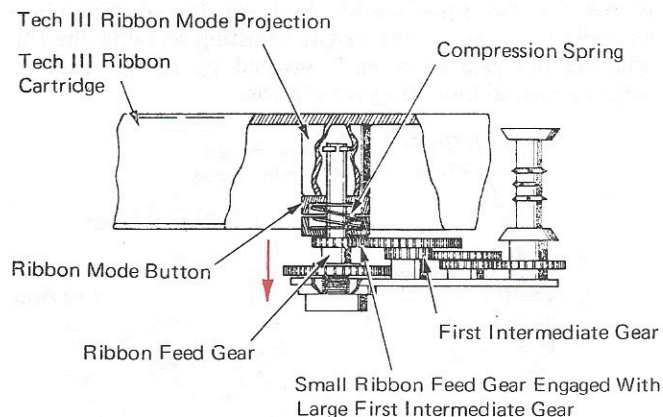


Figure 9 – IBM Tech III Ribbon Mode

The ribbon must be kept slightly taut throughout the ribbon path for proper feeding and tracking. This is accomplished by the ribbon shock wire detenting the ribbon supply spool. The ribbon supply spool is not allowed to rotate until the ribbon applies sufficient tension on the shock wire to release the detent. As fresh ribbon is supplied, some tension is released from the shock wire allowing the detent to reseat in the teeth of the supply spool (Figure 10).

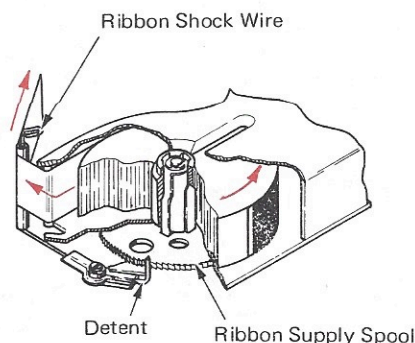


Figure 10 – Ribbon Tension Spring

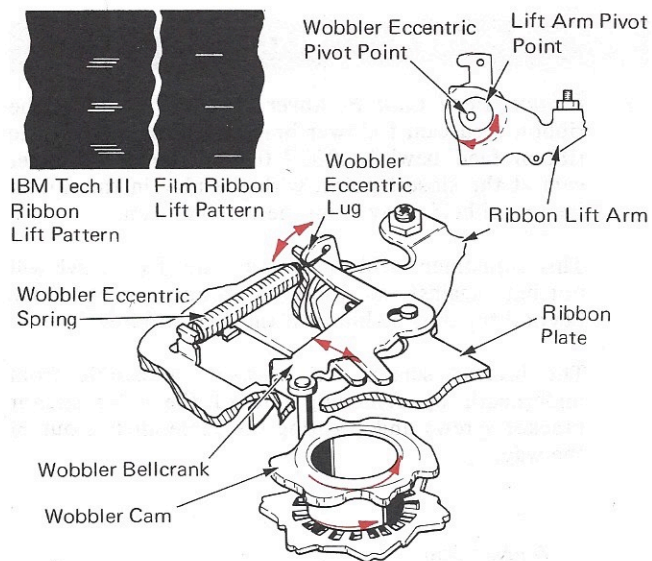


Figure 14 – Ribbon Lift Wobble Mechanism

The wobbler mechanism is active only in the IBM Tech III ribbon mode. The front of the wobbler bellcrank is free to move vertically. Its vertical position is controlled by two lugs on the wobbler bellcrank contacting the ribbon feed gear. When the feed gear is pressed down into the IBM Tech III ribbon mode by the cartridge, it also moves the wobbler bellcrank down into the operated position. When the wobbler bellcrank is in the operated position, a stud on the forward end of it follows the wobbler cam which is mounted directly above and turns with the ribbon feed and lift wheel. The motion from the wobbler cam rotates the wobbler bellcrank which operates the wobbler eccentric, causing the desired variation in the ribbon lift pattern (Figure 15).

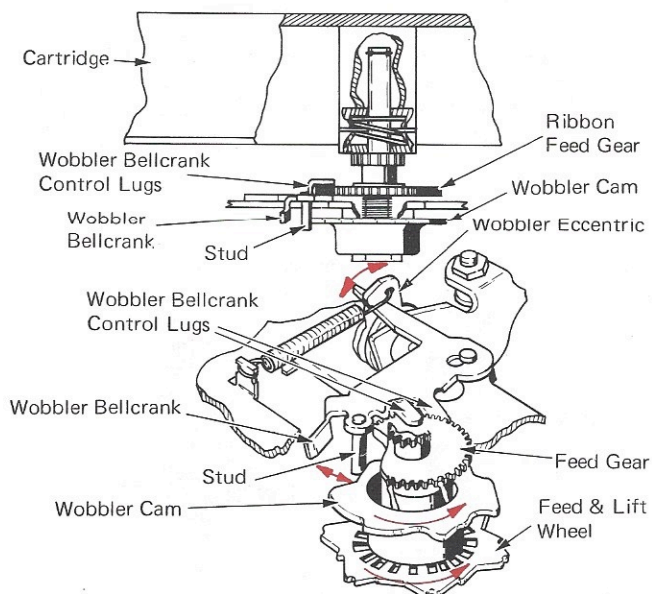


Figure 15 – IBM Tech III Mode – Wobbler Active

When the mechanism is in the film ribbon mode, the feed gear is up. This allows a lug on the wobbler bellcrank to be latched against the ribbon plate, causing the bellcrank to be inactive (Figure 16).

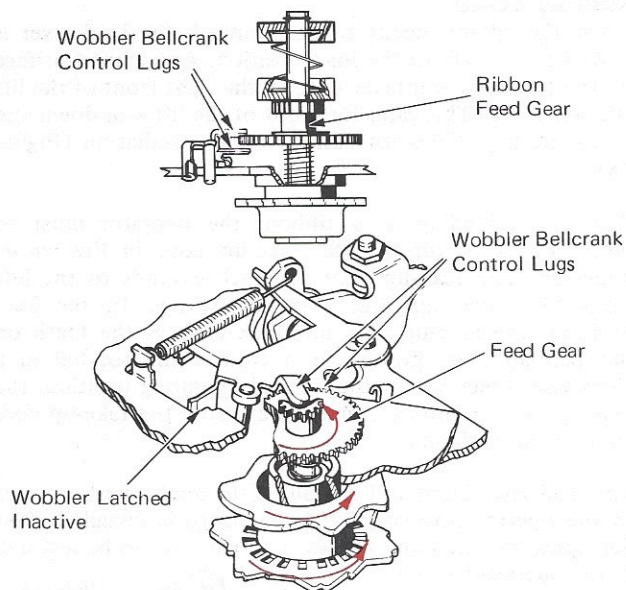


Figure 16 – Film Ribbon Mode – Wobbler Inactive

STENCIL MODE

When the typewriter is used for typing stencils, the ribbon feed and lift operations must be locked out. This is achieved by moving the stencil lever left to the stencil position. The lever will latch in the stencil position and can be released by pushing the release button. A lug on the stencil lever contacts an extension on the front of the lift control lever, moving the rear of the lift control lever to the right. This moves the lift cam follower roller completely off the lift cam, inhibiting ribbon lift (Figure 17).

When the lift control lever is in the stencil position, a feed lockout lug on it moves behind the feed pawl mounting stud. This prevents rearward movement of the feed pawl, inhibiting ribbon feed.

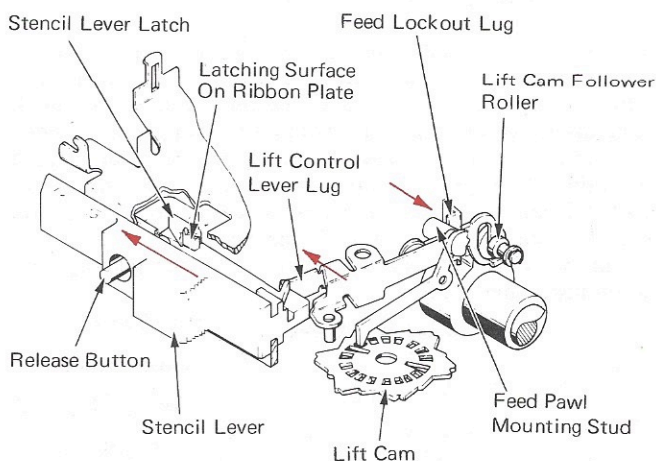


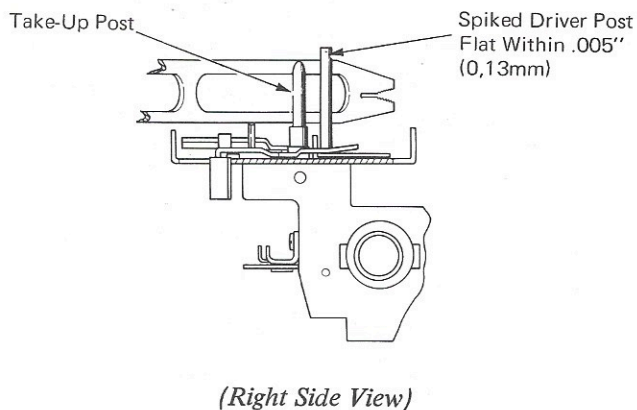
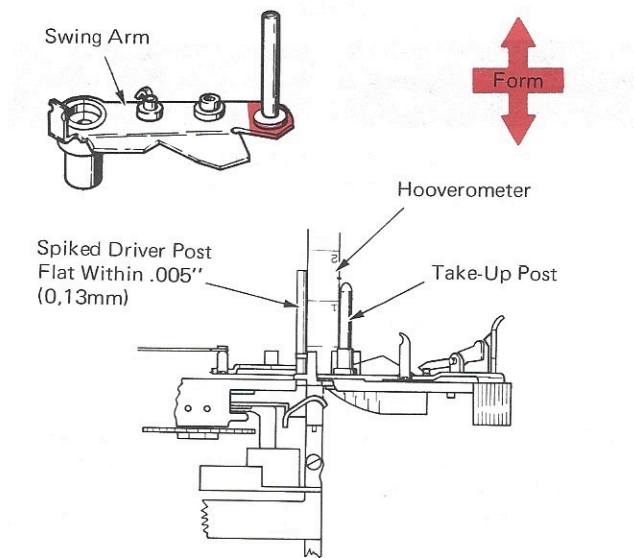
Figure 17 – Stencil Operation

3. **Spiked Driver Post** – The spiked driver post must be parallel to the take-up post within .005". This must be checked in two ways.

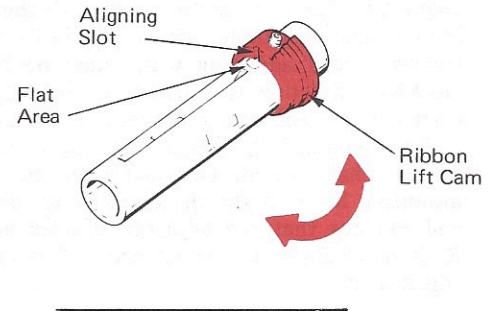
NOTE: The swing arm spring should be connected while making these checks.

- a. Hold the Hooverometer edge flat against the take-up post. Allow the swing arm to close until the spiked driver post contacts the other edge of the Hooverometer. The spiked driver post should be flat to the Hooverometer edge within .005".
- b. Place a flat surface (such as an aligning wrench) against the take-up post and spiked driver post. The posts should both be flat to the surface within .005".

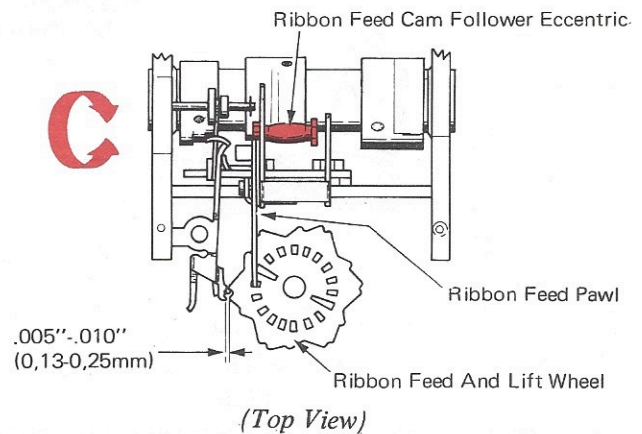
Form the free end of the swing arm to obtain these conditions. The symptom of an out of parallel condition will be a bind within the cartridge caused by the used ribbon coning. This could cause feed failures.



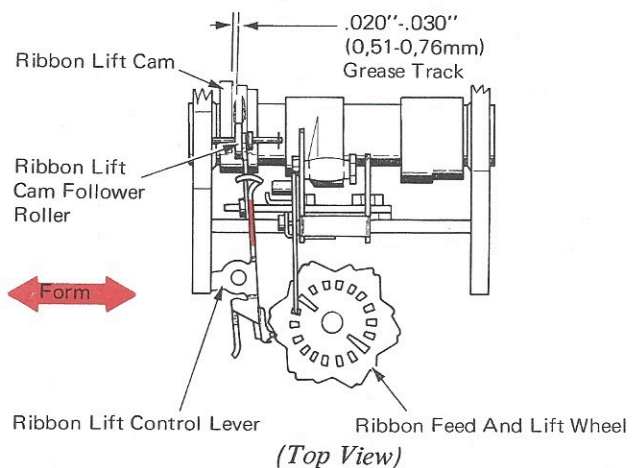
4. **Ribbon Lift Cam** – Adjust the ribbon lift cam so the aligning slot is lined up with the front edge of the flat on the print sleeve.



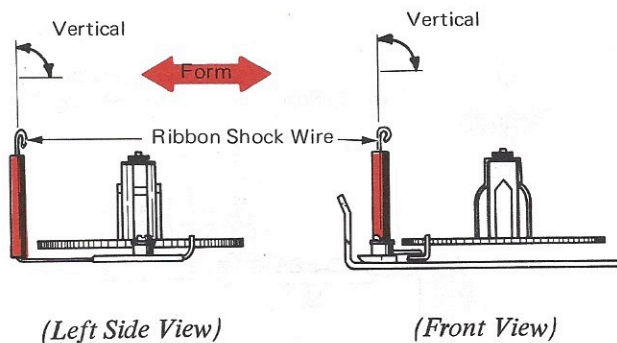
5. **Ribbon Feed Cam Follower Eccentric** – Adjust the ribbon feed cam follower eccentric to cause the ribbon feed pawl to drive the ribbon feed and lift wheel .005"-.010" past the detented position on a high lobe of the ribbon feed and lift wheel camming surface. Keep the eccentric in the lower front half of its orbit.



6. **Ribbon Lift Control Lever** – Position the ribbon feed and lift wheel detented in the medium lift position (middle lobe). Form the ribbon lift control lever to position the left edge of the ribbon lift cam follower roller .020"-.030" from the edge of the high lift lobe. This may also be observed dynamically by putting fresh grease on the ribbon lift cam and observing the roller track in the grease on the medium lift lobe.

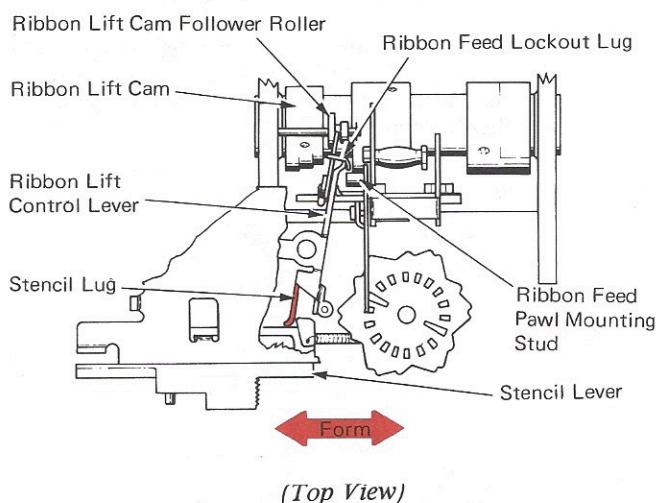


10. **Ribbon Shock Wire** – Form the shock wire to be vertical front-to-rear and left-to-right. This adjustment may need to be refined for proper ribbon tracking through the left ribbon lift guide.



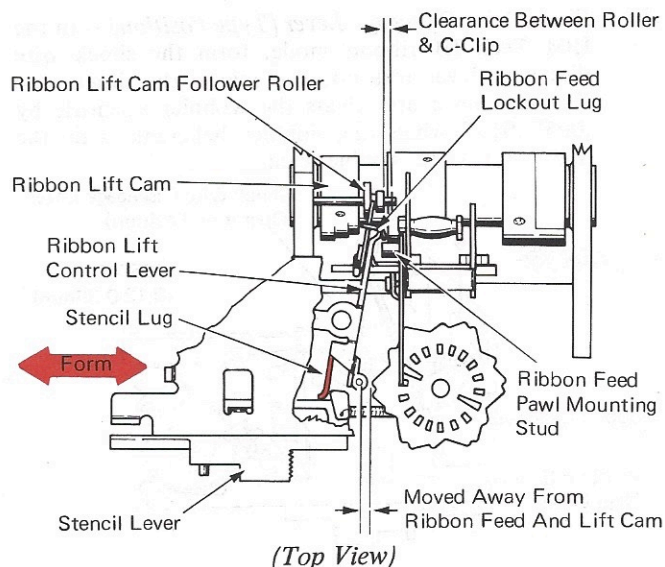
11. **Stencil Adjustment** – Form the stencil lug on the ribbon lift control lever to meet two conditions when the stencil lever is latched in the stencil position.

- The ribbon feed lockout lug must engage the ribbon feed pawl mounting stud by approximately the thickness of the lockout lug.

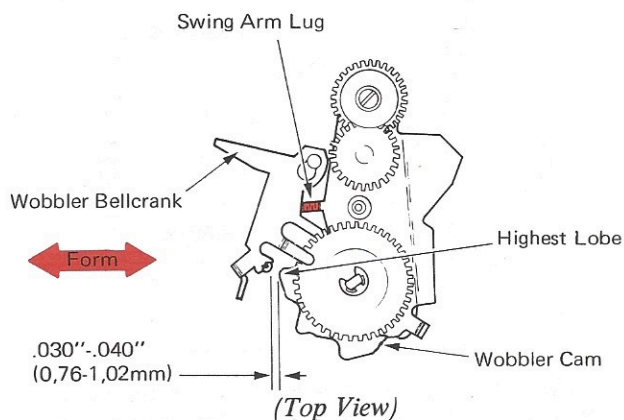


- The ribbon lift cam follower roller must be moved to the right, completely off the ribbon lift cam, but still have some clearance between the roller and the C-clip at the end of its shaft.

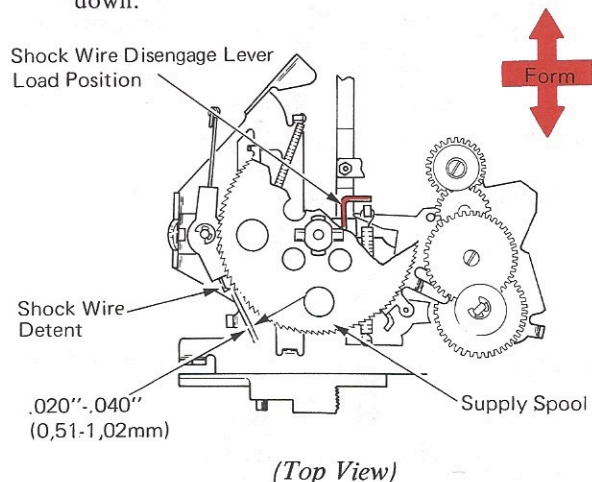
NOTE: During normal typing, in the low lift ribbon position, the ribbon feed lockout lug on the ribbon lift control lever must clear the ribbon feed pawl mounting stud. If necessary, form the ribbon feed lockout lug to obtain this condition. If the lug is formed, recheck the stencil adjustments.



12. **Swing Arm Lug** – Form the lug on the swing arm that contacts the wobbler bellcrank so the cam follower stud on the wobbler bellcrank clears the high lobe of the wobbler cam by .030"-.040" when the load lever is detented in the load position.



13. **Shock Wire Disengage Lever (Load Position)** – Form the right-hand arm on the shock wire disengage lever so the shock wire detent clears the ribbon supply spool by .020"-.040" when the load lever is in the load position. Ensure that the wobbler eccentric lug cannot get under the arm. If necessary, form the arm down.



"CORRECTING" OPERATIONAL THEORY

The purpose of the correcting mechanism is to enable an operator to correct original copy errors from the keyboard. A correcting tape supply spool is mounted at the left rear corner of the ribbon plate and a tape take-up spool is mounted at the right rear corner of the ribbon plate (Figure 1). The correcting tape is guided from the tape supply spool on the left, across the front of the cardholder, to the tape take-up spool on the right.

To correct an error, the operator depresses the correcting key and then restrikes the incorrect character. As the operator restrikes the incorrect character, the correcting tape is lifted between the ribbon and the paper. The impact of the typehead causes the correcting tape to either cover up the character or lift it off of the paper, depending upon which supplies are used. No escapement occurs during this correcting cycle. Since the carrier is still positioned at the point where the error was committed the operator can type the correct character and resume normal typing.

Each of the correcting tapes is designed to be used with a specific IBM ribbon. The IBM Tech III Cover-up Tape is used with the IBM Tech III Ribbon (both are color coded blue). The Lift-off Tape is used with the IBM Correctable Film Ribbon (both are color coded yellow). Due to incompatibility, intermixing of supplies is not recommended.

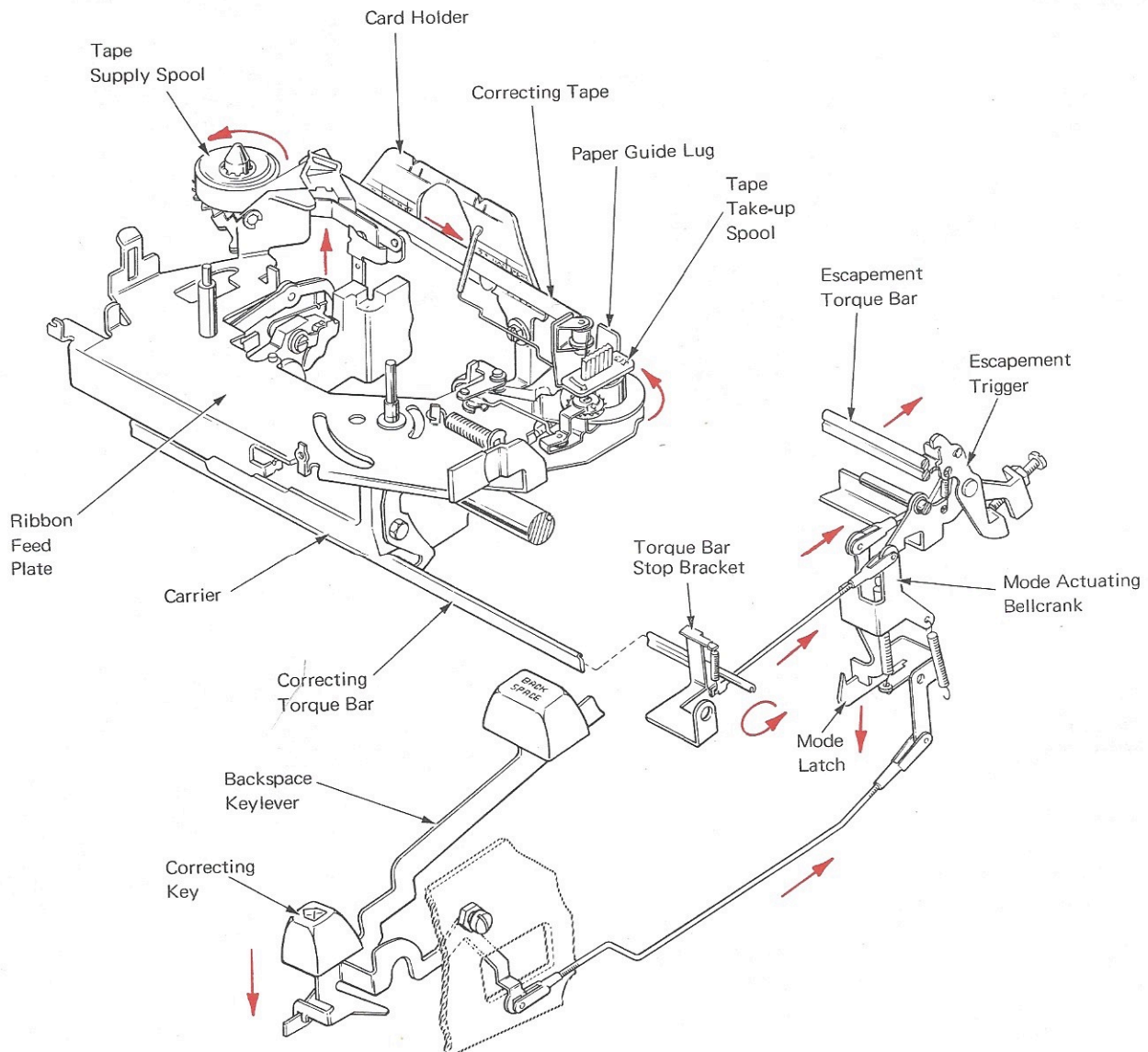


Figure 1 – Correcting Mechanism

CORRECTING TAPE FEED

The correcting tape feed mechanism is located on the right side of the carrier (Figure 5). It is designed so that the correcting tape is fed in two increments. One-third is fed before print and two-thirds is fed after print. This is accomplished by a tape feed cam with two high points, the second high point supplying twice as much motion as the first.

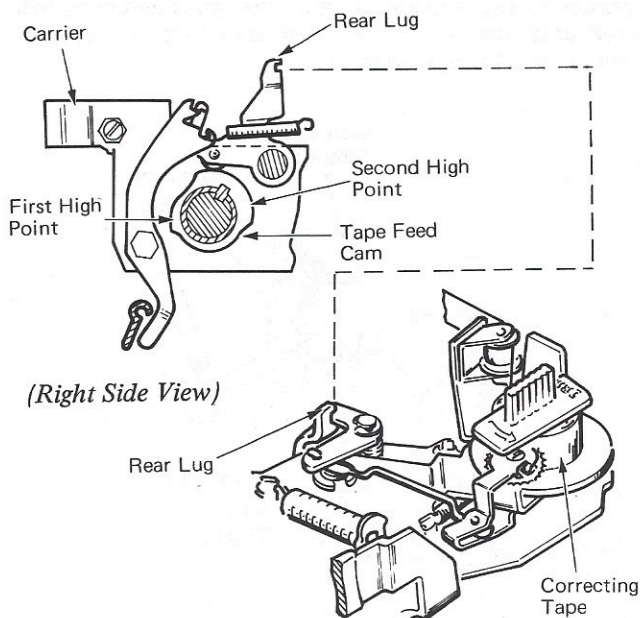


Figure 5 – Tape Feed at Rest

The feed mechanism is actuated by the operation of the correcting torque bar as was the tape lift mechanism. The torque bar rotates the step on the tape feed inhibitor out of the path of the tape feed cam follower (Figure 6). As a print operation occurs and the tape feed cam rotates, the tape feed cam follower is allowed to follow the contour of the cam from its highest point toward its low dwell. The rear lug on the follower moves forward allowing the spring loaded tape feed pawl to rotate counterclockwise by means of a feed bellcrank and feed link, engaging the preceding window in the spiked wheel.

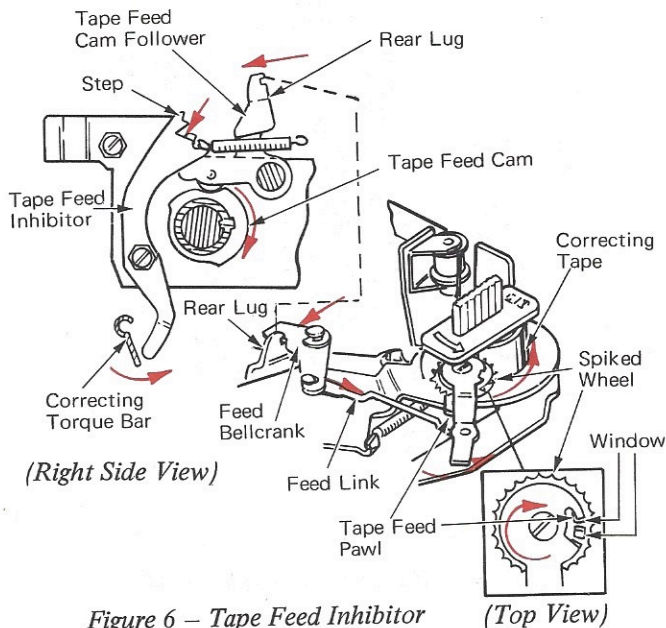


Figure 6 – Tape Feed Inhibitor

The tape feed cam then rotates to its first high point. The tape feed pawl by means of the cam follower, feed bellcrank and link rotates the spiked wheel clockwise for the first one-third tape feed (Figure 7). The feed cam then rotates to a low dwell position again. The follower is prevented from contacting the cam on its low dwell by the inhibitor. The inhibitor prevents placing the heavy cam follower spring load on the cam during print which occurs at this time. The cam then begins its rise to the second high point and the cam follower causes the correcting tape to be fed the remaining two-thirds of the tape feed increment.

The spiked wheel which is mounted on the tape feed swing arm is heavily spring loaded towards the tape take-up spool. This causes the spikes on the wheel to dig into the used tape. As the spiked wheel rotates, it causes the take-up spool to rotate, pulling new tape into the print position and winding up the used tape.

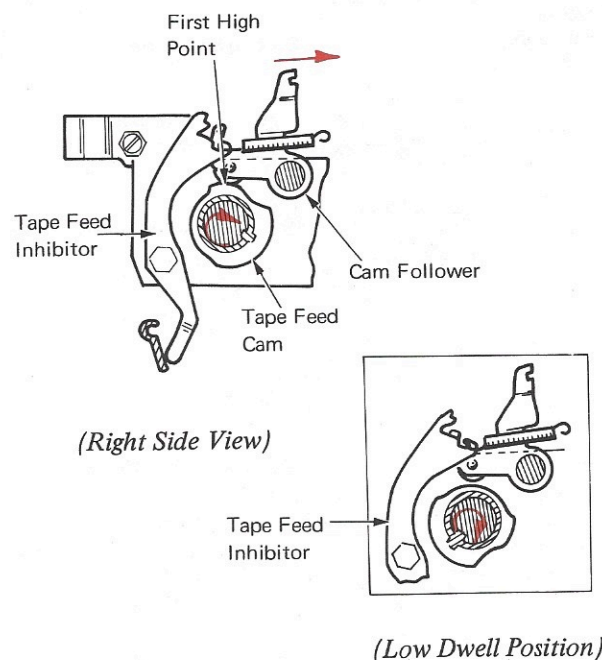
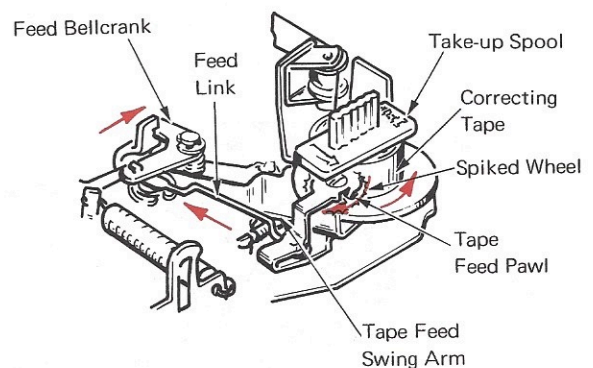


Figure 7 – Tape Feed Operating



CORRECTING TAPE LOAD

When the correcting tape needs to be changed, the tape load lever is moved to the right to the load position (Figure 12). The load lever performs three functions to facilitate installation and removal of the tape.

1. A guide roller mounted on the rear of the load lever pivots forward.
2. A separator wire is pivoted top to the front by means of a camming slot in the load lever.
3. The spiked wheel which is mounted on the tape feed swing arm is pivoted forward by a lug on the load lever.

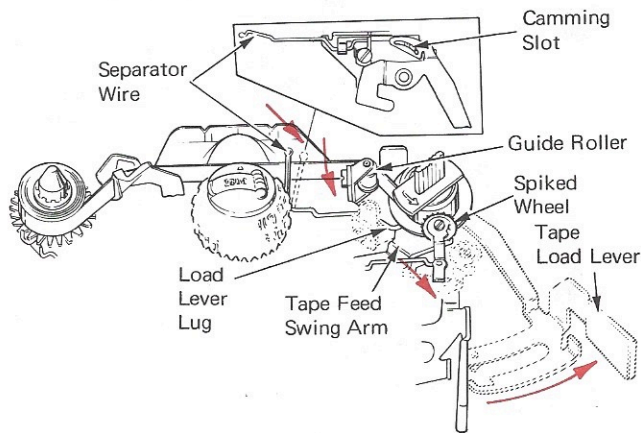
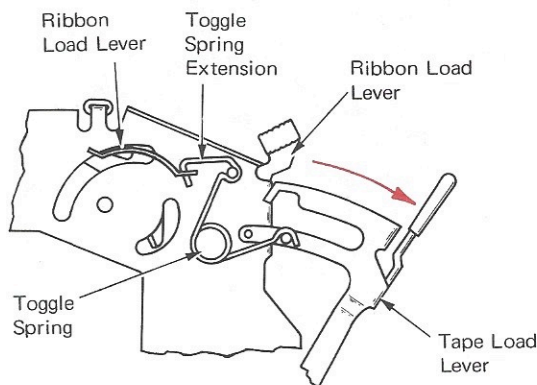


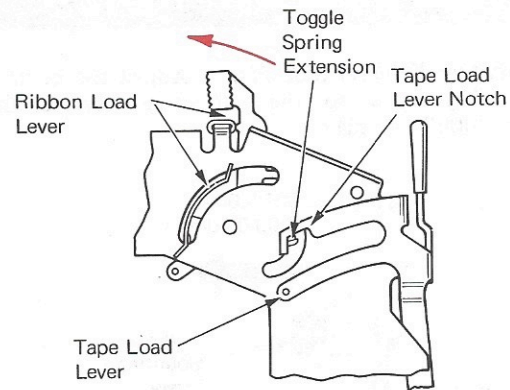
Figure 12 - Tape Load

LOAD INTERLOCKS

A toggle spring holds the tape load lever in either the load or type position (Figure 13). An extension on the toggle spring engages a hole in the ribbon load lever so it cannot be moved to the load position while the tape load lever is in the load position. When the ribbon load lever is operated, an extension on the ribbon load lever enters a notch in the tape load lever to prevent operating the tape load lever to the load position.



Ribbon Load Lever Load Position (Bottom View)



Tape Load Lever Type Position (Bottom View)

Figure 13 - Load Interlocks

To prevent the operator from turning the take-up spool in the wrong direction when taking up the slack, a take-up spool detent engages a ratchet on the bottom of the take-up spool (Figure 14).

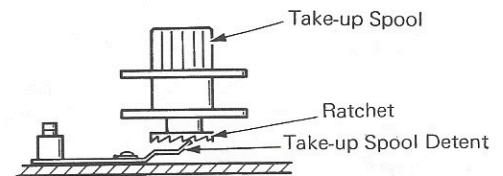
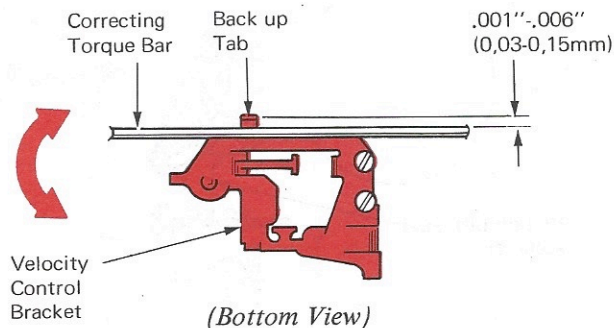
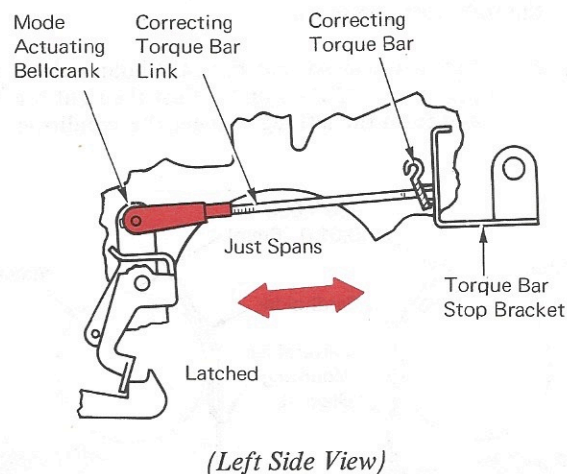


Figure 14 - Take-up Spool Detent

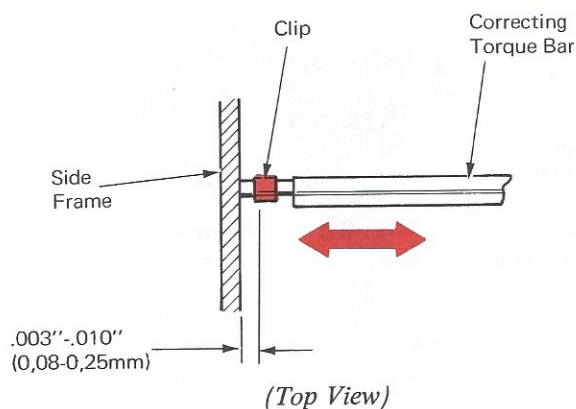
6. **Velocity Control Bracket** – Adjust the velocity control bracket so that the back-up tab on the bracket has a clearance of .001”-.006” with the correcting torque bar with the carrier positioned at the extreme left margin.



9. **Correcting Torque Bar Link** – Adjust the correcting torque bar link to just span the distance between the torque bar and the mode actuating bellcrank with the bellcrank latched at rest.



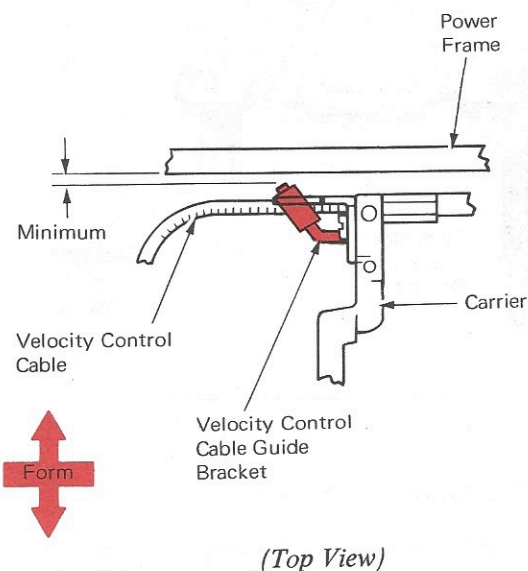
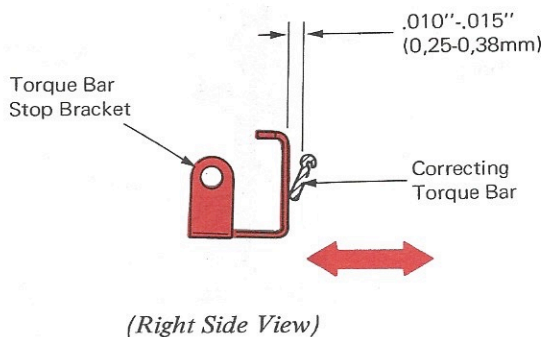
7. **Correcting Torque Bar End Play** – Position the clip on the left end of the correcting torque bar left or right so the torque bar has .003”-.010” end play.



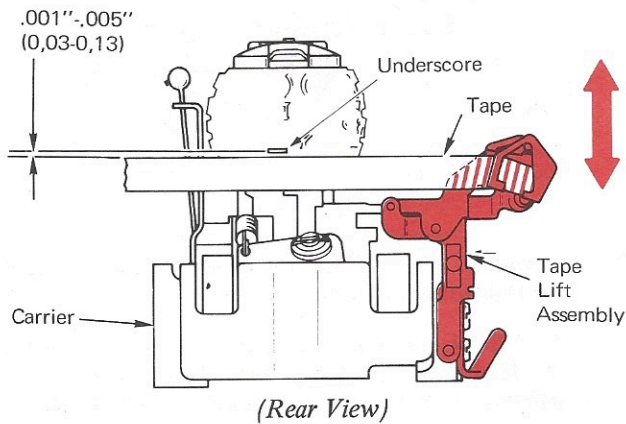
10. **Cable Guide Bracket** – Form the velocity control cable guide bracket as far to the rear as possible and still not touch the power frame. The bracket must keep the velocity control cable from getting behind the carrier.

NOTE: Check that the guide bracket clears the frame at the extreme left margin.

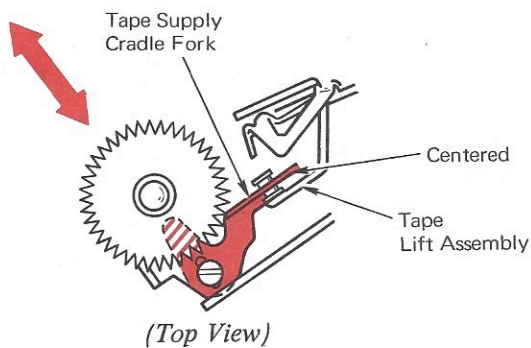
8. **Torque Bar Stop Bracket** – Adjust the torque bar stop bracket located at the right end of the torque bar front- to- rear for a clearance of .010”-.015” between the bracket and the top curvature of the correcting torque bar.



- b. Vertically so that the bottom of the underscore clears the top of the tape by .001"-.005" when the tape is at rest and the underscore is in the print position.

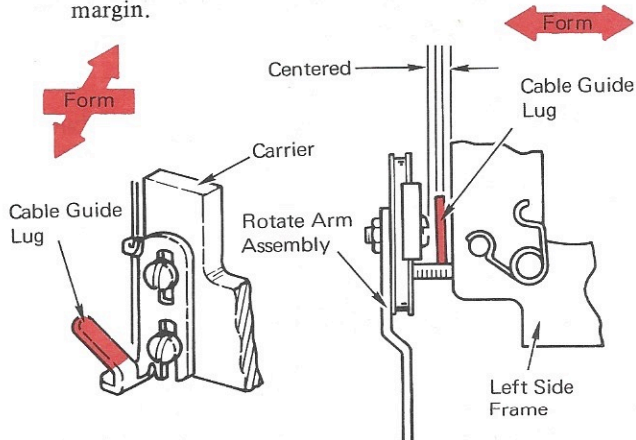


14. **Tape Supply Cradle Fork** – Position the cradle fork so that it centers in the groove of the stud mounted on the tape lift assembly.



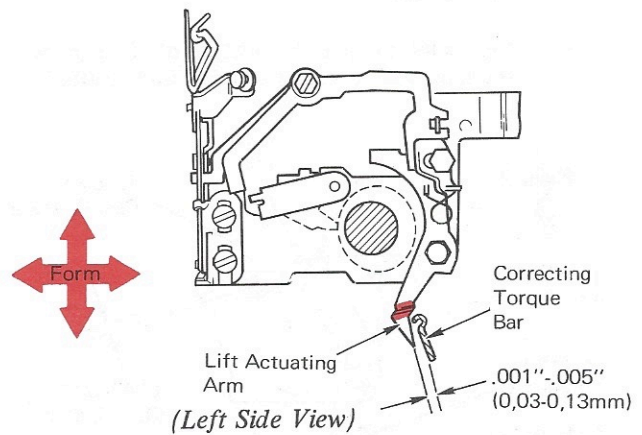
15. **Cable Guide Lug** – Form the cable guide lug on the tape lift assembly front-to-rear so it is centered between the rotate arm assembly and the power frame when the carrier is at the extreme left margin.

NOTE: Be sure to maintain a sufficient left-to-right angle to ensure the velocity control cable cams under the carrier when the carrier is at the extreme left margin.



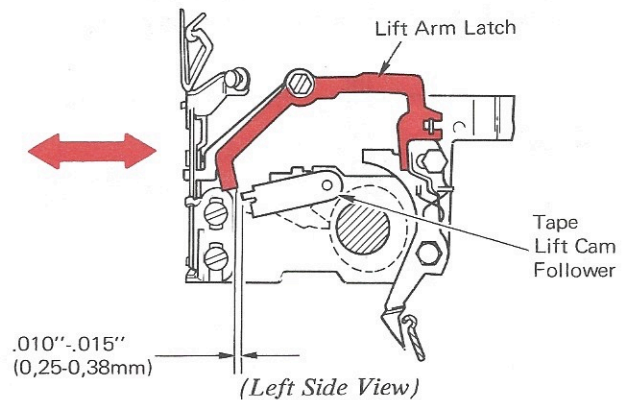
16. **Lift Actuating Arm** – With the torque bar at rest, form the lift actuating arm for a clearance of .001"-.005" between the lift actuating arm and the correcting torque bar at the closest point.

NOTE: This adjustment can most easily be made from the bottom of the machine.

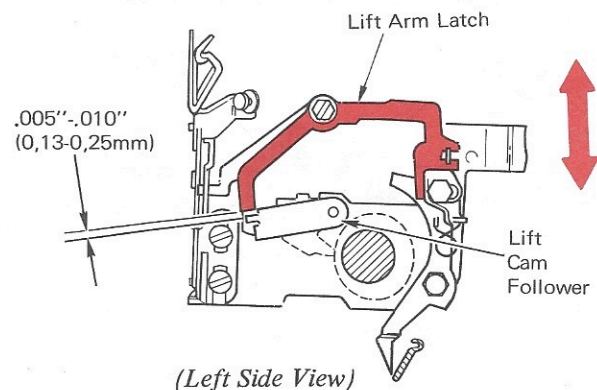


17. **Lift Arm Latch** – Adjust the lift arm latch to satisfy the following conditions:

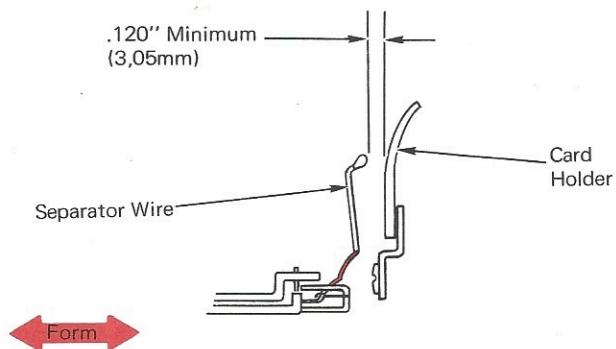
- a. With the correcting mechanism at rest, position the lift arm latch front-to-rear so the tape lift cam follower clears it by .010"-.015."



- b. With the print mechanism at rest and the correcting torque bar operated, the bottom of the lift arm latch must clear the lift cam follower by .005"-.010."

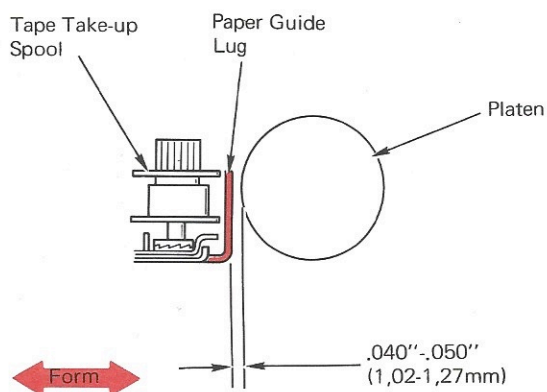


- c. With the load lever in the load position, the top of the separator wire must clear the card holder by at least .120."



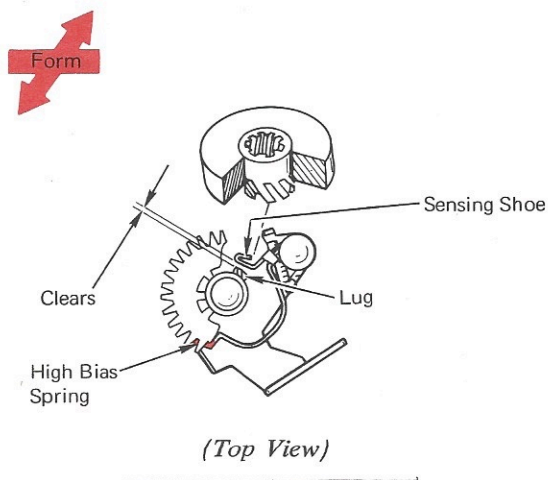
(Right Side View) (Load Position)

22. **Paper Guide Lug** – Form the paper guide lug front-to-rear so that it clears the platen by .040"-.050."



(Right Side View)

23. **High Bias Spring** – Form the upright tip of the high bias spring in or out so that the sensing shoe clears the lugs on the tape supply spool when the mechanism is at rest.



MARGINS AND LINELOCK OPERATIONAL THEORY

The purpose of the margin mechanism is to allow the operator to vary the length of the writing line. This is accomplished by two margin stops and a margin rack (Figure 1). The left and right margins are determined by the position of the margin stops on the margin rack. The left margin stop is used to limit carrier travel to the left.

The right margin stop first operates a warning bell which alerts the operator when the carrier approaches the right margin, then locks the keyboard to prevent further typing.

Depression of the margin release keylever allows typing beyond the left and right margins by rotating the rack. This disengages either margin stop from the line lock bracket on the carrier.

The margin rack is a flat rack containing teeth along its rear edge. The number of teeth per inch in the margin rack corresponds to the pitch of the machine.

Each margin stop has a pin and slider assembly that meshes with the teeth at the rear of the margin rack. Each margin

stop has a margin set lever attached to the pin and slider assembly. The margin set levers extend through a slot in the front case of the machine to make them accessible to the operator. Either margin stop may be repositioned by pushing the margin set lever to the rear to disengage the pin from the rack, then, by sliding the margin stop along the rack to the desired location. A line on each margin set lever serves as a pointer to indicate the position of the margin stop in relation to the scale on the front of the case. A pointer, located on the front of the carrier, indicates the position of the carrier (Figure 1).

The left margin stop controls the left margin. When the carrier is returned by the carrier return mechanism, an extension of the left margin stop is struck by the margin stop latch pivoted on the linelock bracket attached to the carrier. This action forces the margin rack to the left to unlatch the carrier return mechanism and leaves the carrier resting at the left margin position.

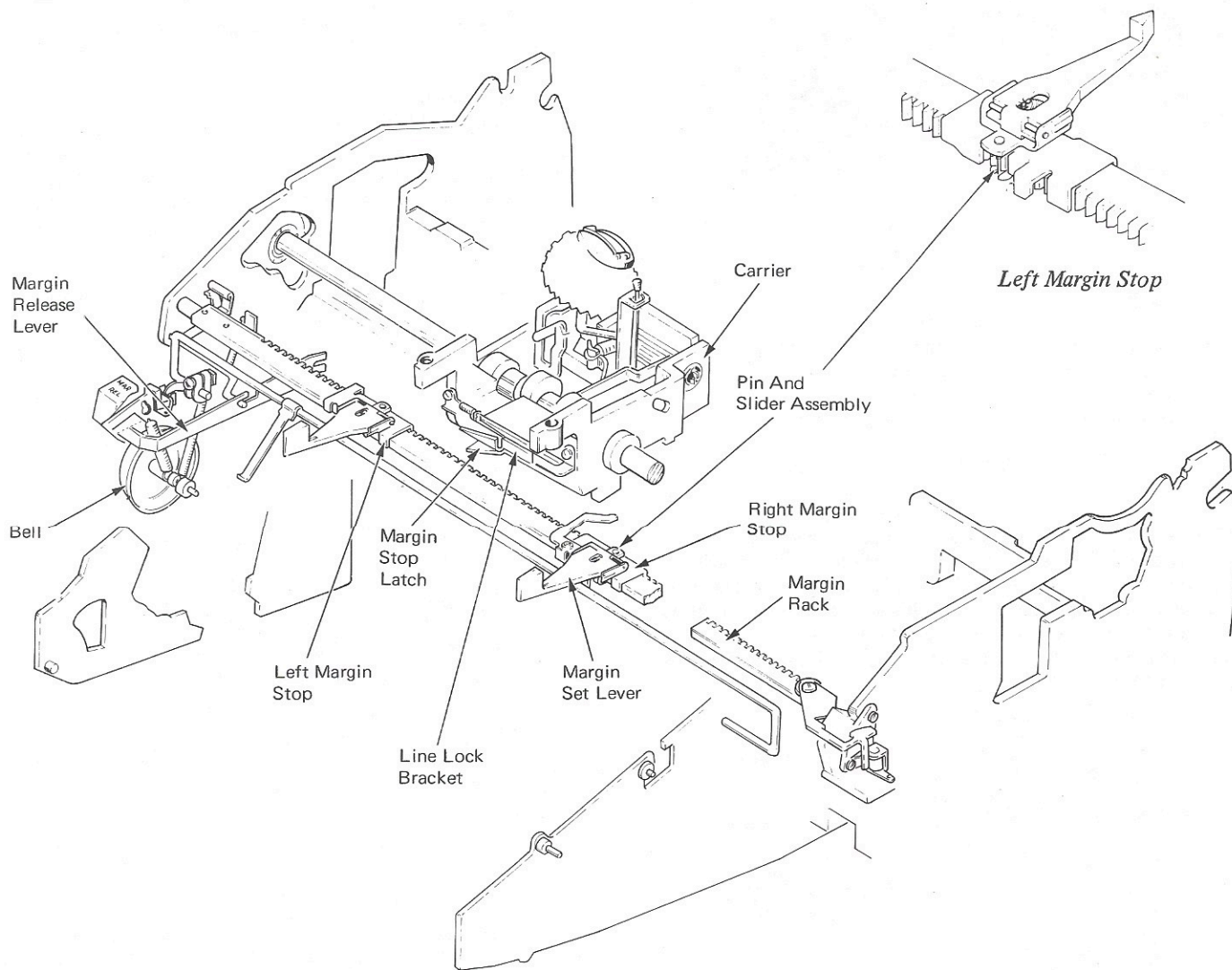
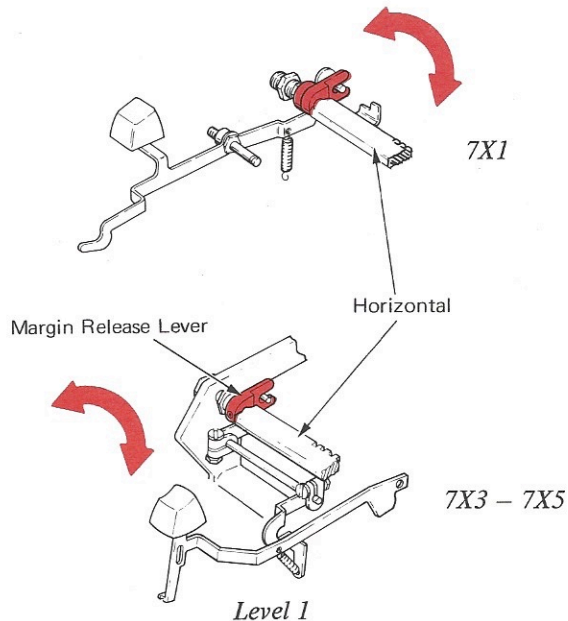


Figure 1 - Margin Control

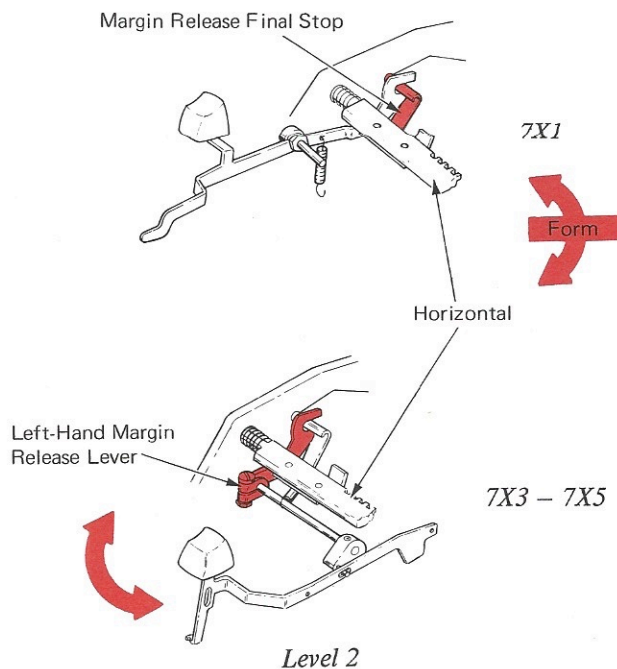
MARGINS AND LINELOCK ADJUSTMENTS

NOTE: Dual pitch margin adjustments are slightly different. See "Switch Pitch Adjustments" section of this manual.

1. **Margin Rack Horizontal** – The margin rack must rest on a horizontal plane.
 - a. **Level 1** – 7X1, 7X3, and 7X5 adjust margin release lever.

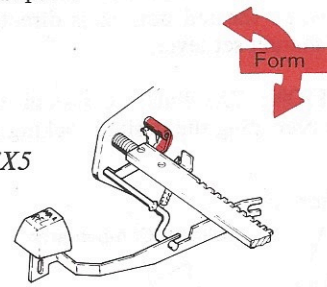


- b. **Level 2** – 7X1 only – Form margin release lever stop. On 7X3 and 7X5 machines adjust margin release lever for 1/32" engagement with margin stop.



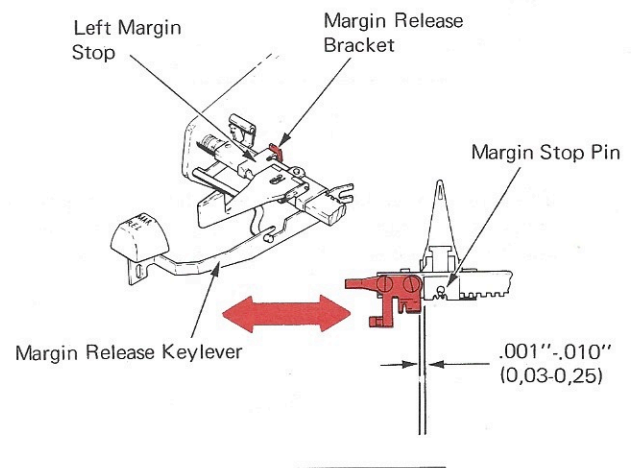
- c. **Level 3** – 7X1, 7X3, 7X5 form margin release final stop.

7X1 – 7X3 – 7X5

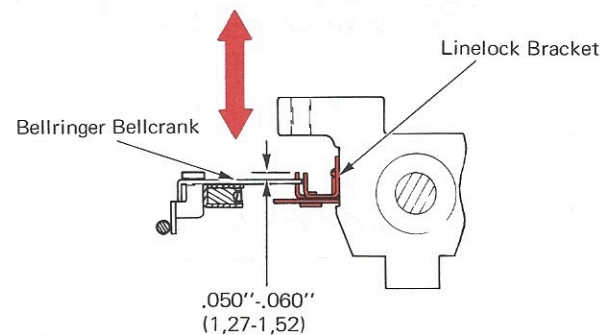


Level 3

2. **Left Hand Final Stop** – Position the margin release bracket left-to-right on the margin rack so it will clear the margin stop by .001"-.010" when the margin stop pin is fully seated in the extreme left-hand tooth of the margin rack.



3. **Linlock Bracket** – Adjust the linlock bracket up or down so the bellringer bellcrank contacts the bracket .050"-.060" from the top.



(Right Side View)

COVERS OPERATIONAL THEORY

There are three types of covers: tilt-up, console mount, and ring mount. First, we will describe the tilt-up covers, and then the differences between them and the other two types.

TILT UP COVERS

The cover assembly is composed of three major sections. They are the top cover, center cover and bottom cover (Figure 1).

The center cover assembly has the paper guide attached to it. The paper guide may be removed by sliding the guide to the extreme right and pulling straight downward. A section

of the cover material has been removed on the rear side to permit the guide to slide off easily.

The paper table is connected to the center cover assembly by two screws and two brackets. The paper table pivots on two studs mounted on the bracket to allow the platen to be removed from the machine.

A margin scale is attached to the lower lip of the top cover. The scale is graduated to correspond to the pitch of the typewriter. The margin scale is attached to the top cover by an adhesive that becomes active when IBM cleaning fluid is applied.

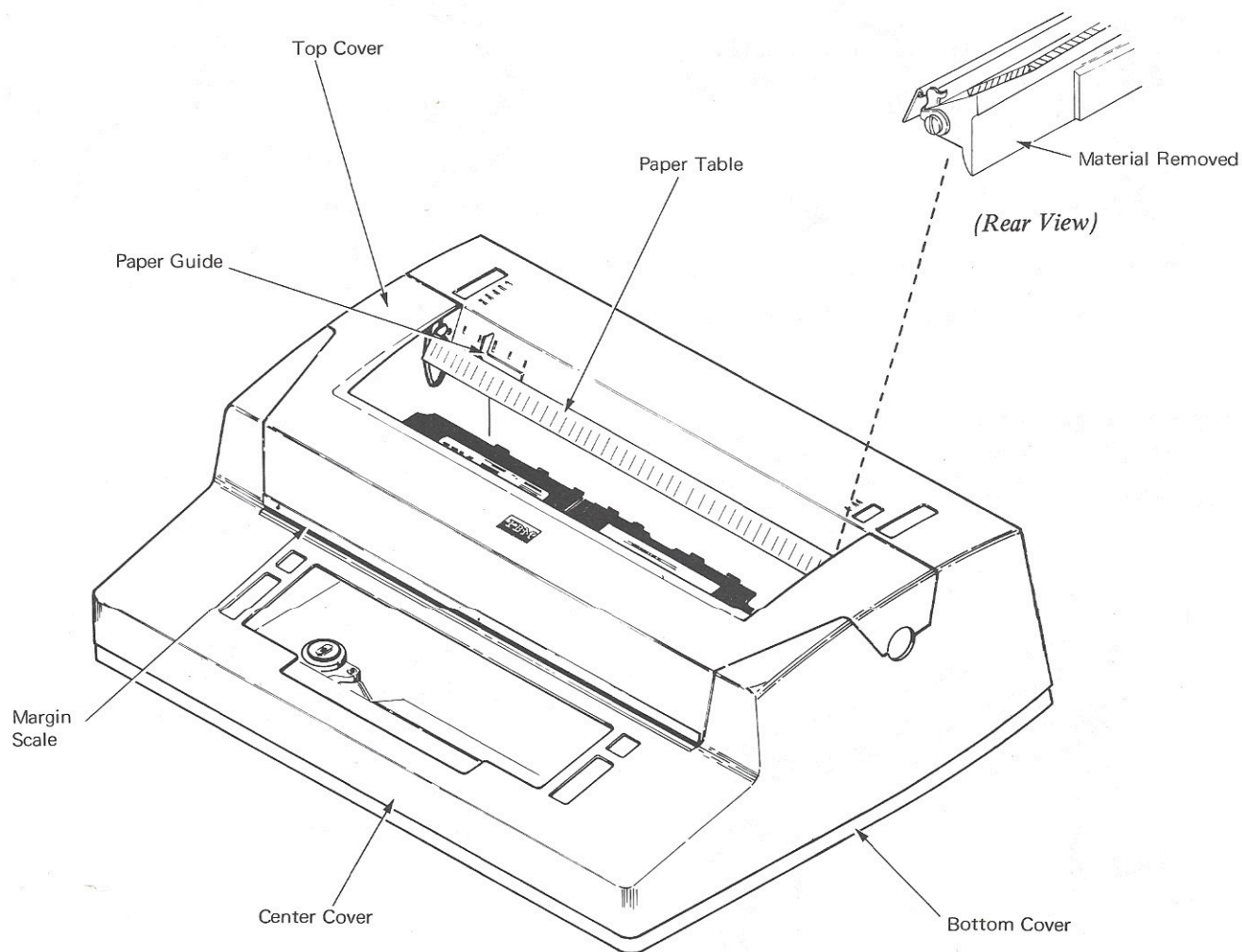


Figure 1 – Covers

The level 3 bottom cover has the vent positioned in a slot at the rear. The rubber mounting to suspend the typewriter inside the case is also contained within the bottom cover (Figure 5).

The level 1 and level 2 center cover assemblies have the vent grille mounted in the rear by a plate. Slotted holes in the plate allow the vent to be removed without removing the plate from the center cover. The level 1 bottom case is held in place by a screw at the center rear.

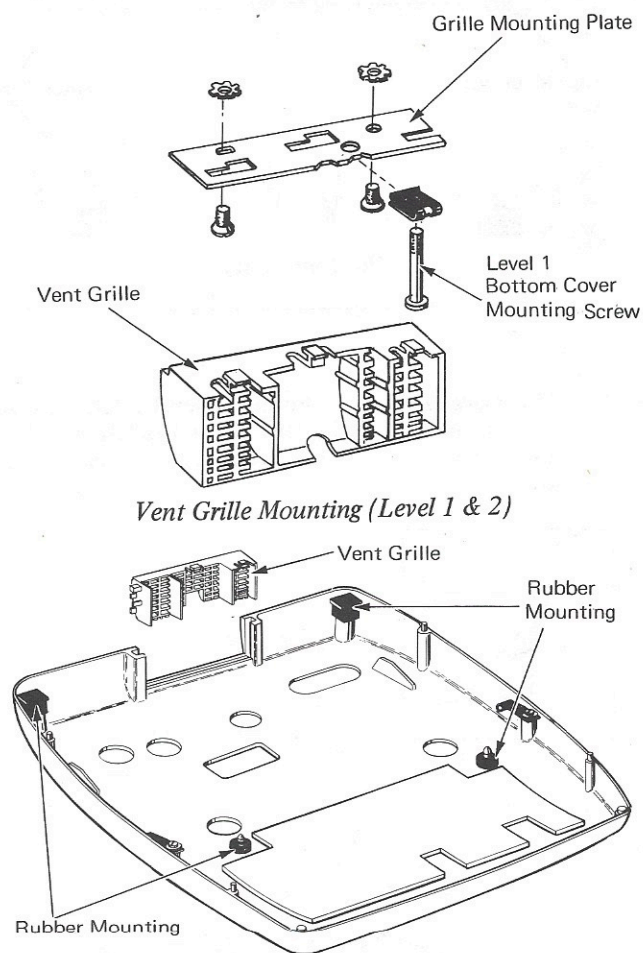


Figure 5 – Bottom Cover Rubber Mounting (Level 3)

The level 2 bottom case is held in place by friction fit and does not use the rear mounting screw (Figure 6).

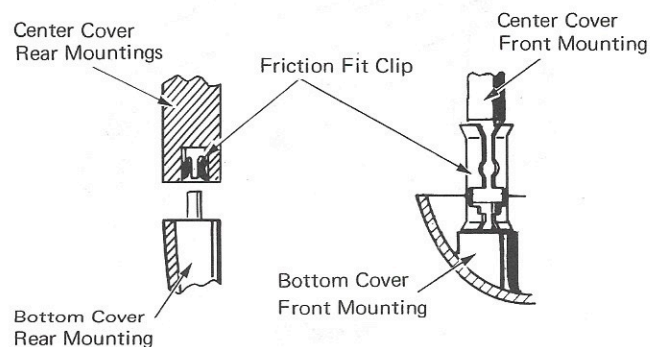


Figure 6 – Bottom Cover Mounting (Level 2)

MOUNTING BRACKETS

The machine mounting brackets are attached to the machine frame and are adjusted vertically. A latch lever (Figure 7) locks the machine to the rubber mounting foot on the left side of the machine (Figure 5).

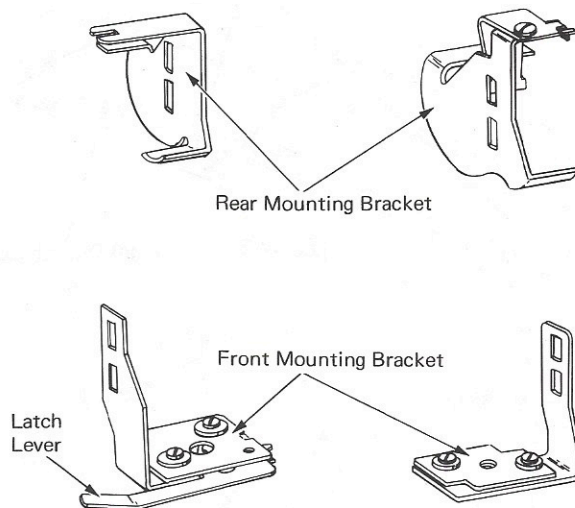


Figure 7 – Frame Mounting Brackets (Level 3)

The level 1 and level 2 cover assemblies are mounted to the machine by brackets secured to the center cover assembly by mounting plates. The machine is suspended on rubber bushings attached to the mounting plates (Figure 8).

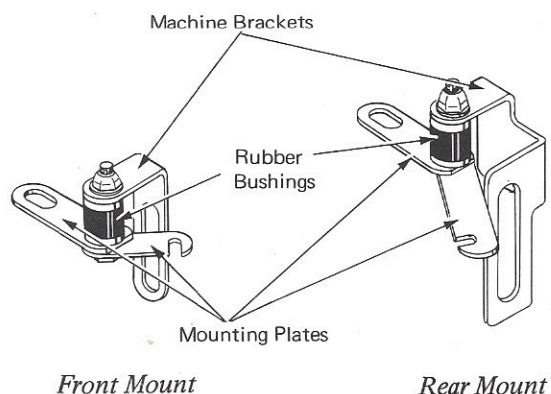
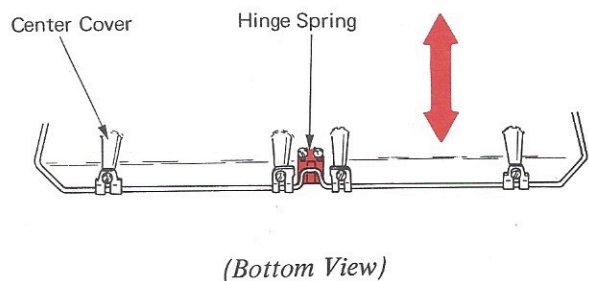
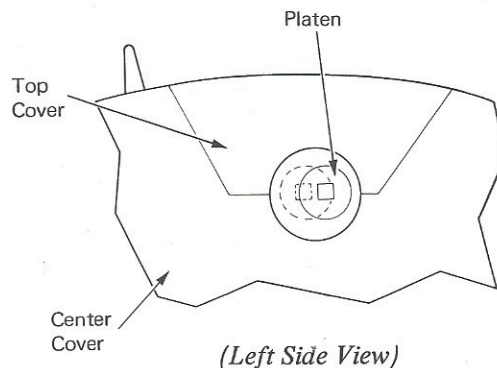


Figure 8 – Center Cover Frame Brackets (Level 1 & 2)

3. *Hinge Spring (Level 1 Only)* – The hinge spring should be positioned front-to-rear so the top cover hinge is detented and held in the open position.

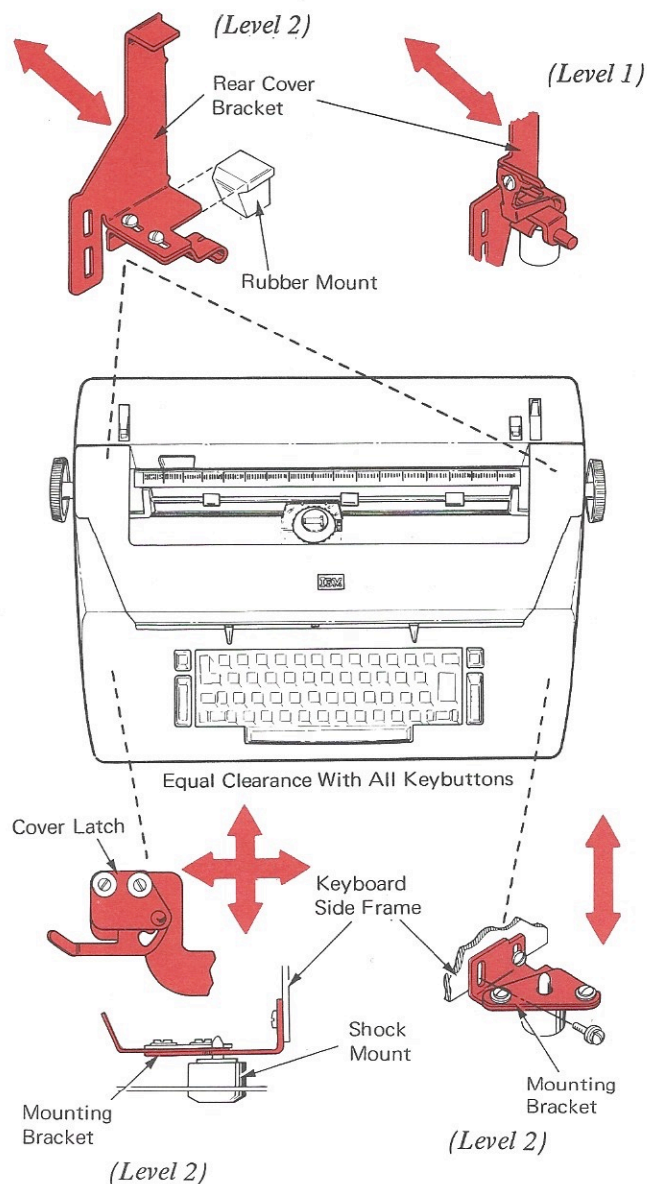


- b. The platen will clear the covers with the copy lever operated to the extreme front and rear position.

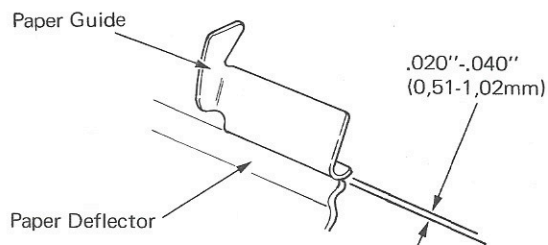


4. *Cover Mounts* – Adjust the cover mounting brackets so the machine will be positioned in the covers and the following requirements are met.

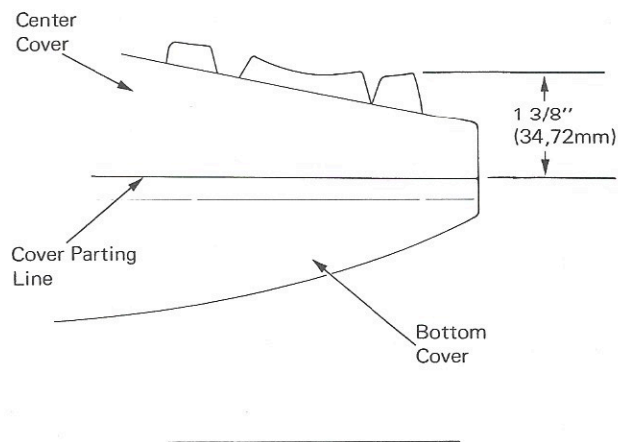
- a. All of the openings for the keybuttons will have equal clearance on each side.



- c. The clearance between the paper guide and the deflector will be .020"-.040."



- d. The top of the spacebar will be 1 3/8" above the parting line of the cover.



CARDHOLDING PLATEN OPERATIONAL THEORY

The purpose of the cardholding platen is to keep cards from slipping while being typed on. The blade of the cardholding platen has a groove under both edges to allow a card to be

held by either the top or the bottom. A movable card stop is mounted on the blade to assist in positioning the card laterally in the card slot (Figure 1).

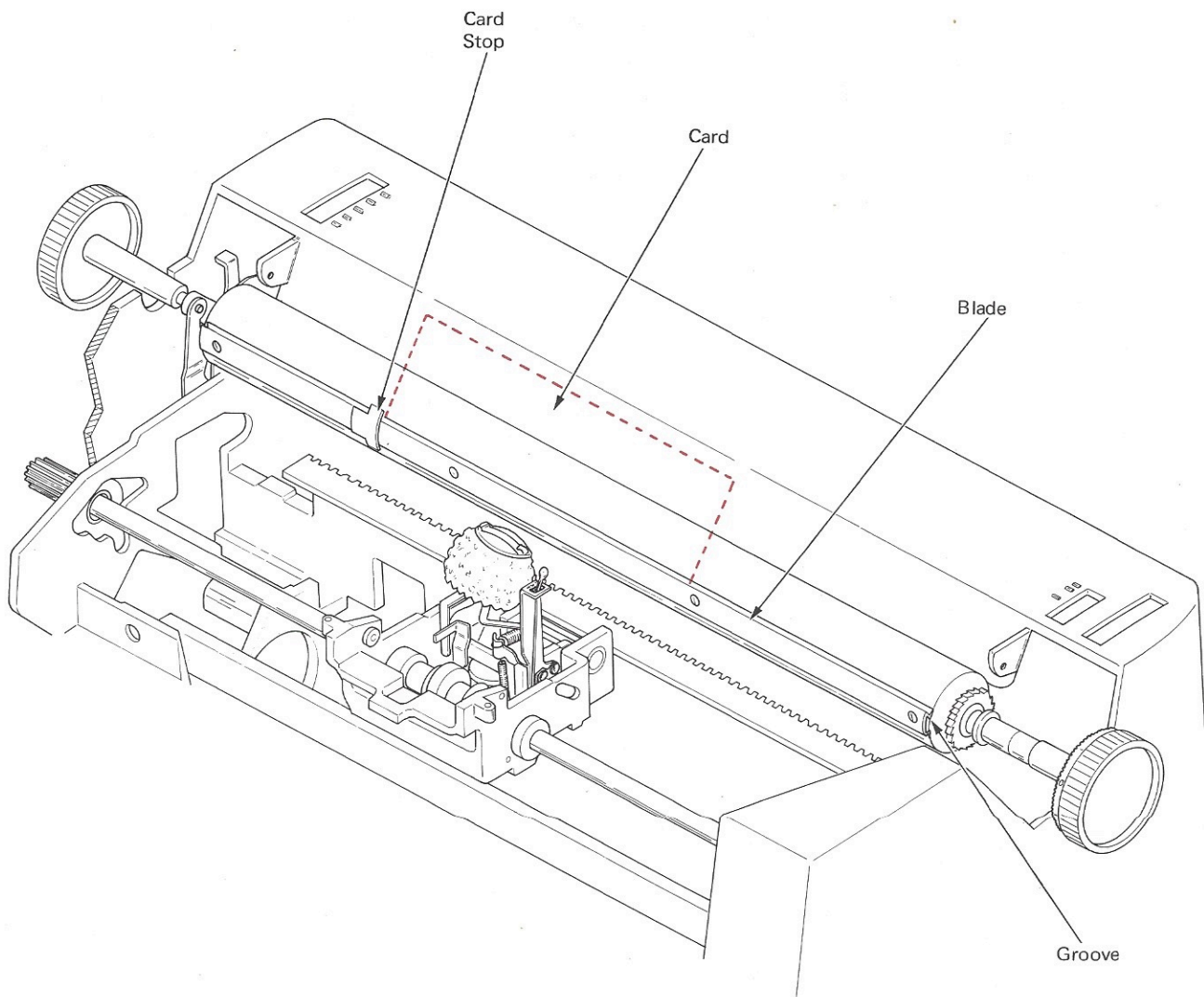


Figure 1 – Cardholding Platen

There Are No Adjustments On A Cardholding Platen.

DEAD KEY DISCONNECT MECHANISM THEORY

The purpose of the dead key disconnect is to disable the dead key mechanism and allow normal escapement for dead key positions. This is accomplished by a cable which pivots the dead key cable away from the finger on the dead key bail. The disconnect cable is controlled from the keyboard by a wheel mounted next to the tab set and clear keybutton.

With the control wheel rotated away from the operator, the dead key mechanism operates normally. With the control wheel rotated toward the operator, the dead key mechanism is disconnected and escapement occurs for dead key positions (Figure 1).

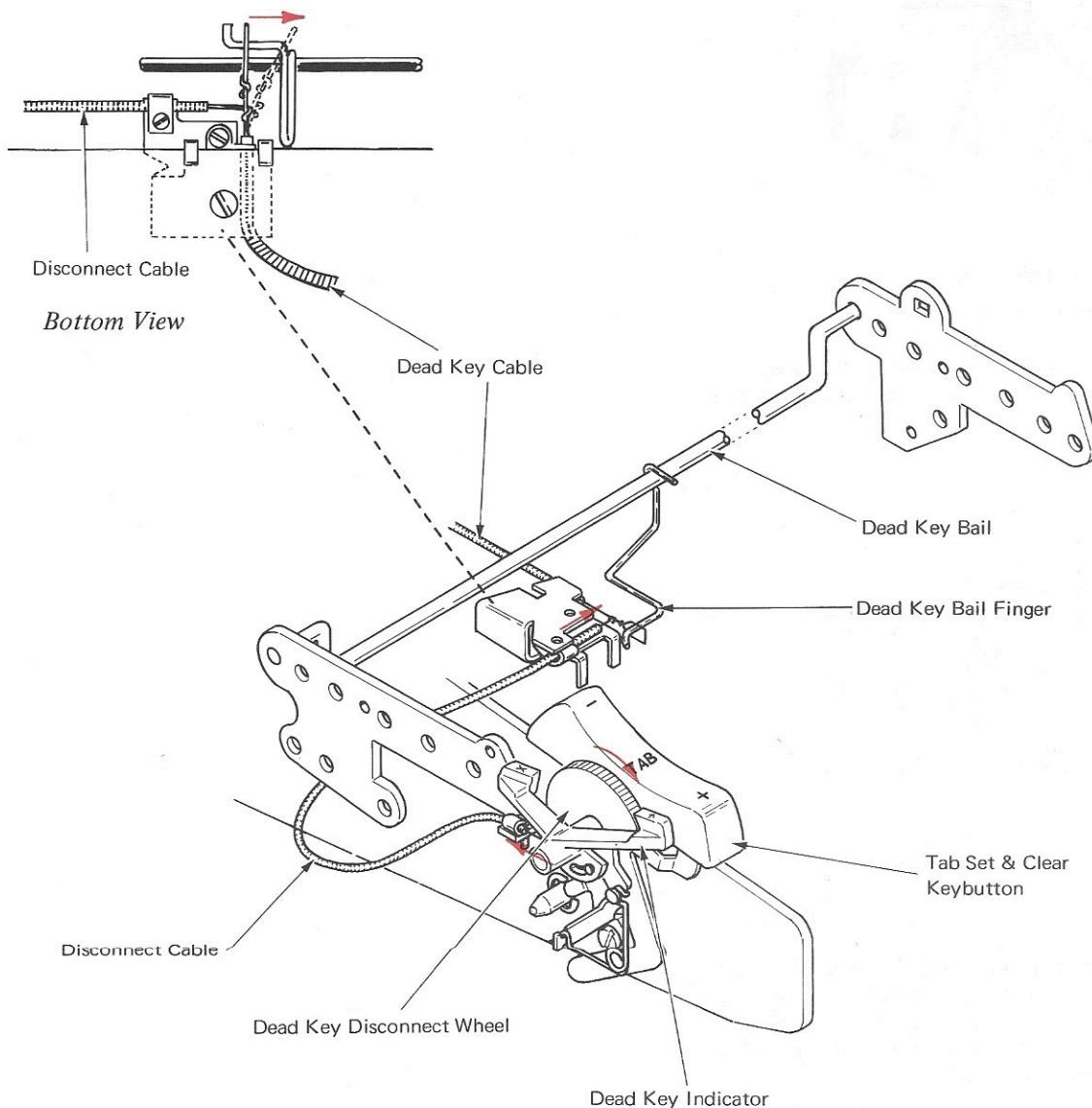


Figure 1 – Dead Key Disconnect Mechanism

The purpose of the dead key mechanism is to prohibit escapement on certain predetermined keyboard positions. This mechanism is used with several foreign keyboards. We will refer to the Trilingual keyboard for discussion purposes (Figure 1).

On the Trilingual keyboard the characters in position 41 and 42 are accent marks used with the vowels in certain words to indicate pronunciation. These are "dead key" characters and when they are typed, the carrier does not escape. The next character typed will appear directly beneath the accent mark.

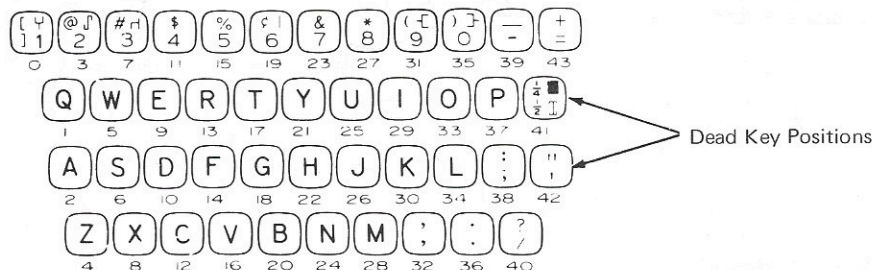


Figure 1 - 74 Trilingual Keyboard

In order to prohibit escapement a 7th selection bail is installed in the keyboard. With the typewriter sitting on its back, the dead key bail is the bottom bail. The interposer for a dead key position has an extra lug to operate this bail. Attached to the bail is a finger over which the eye of a cable is located. This cable is very similar to the cable used to control impression. The sheath of the cable is held rigid by two clamps, one for each end, mounted to the power frame. The rear end of the cable is attached to a hole in the bottom of the escapement trigger (Figure 2).

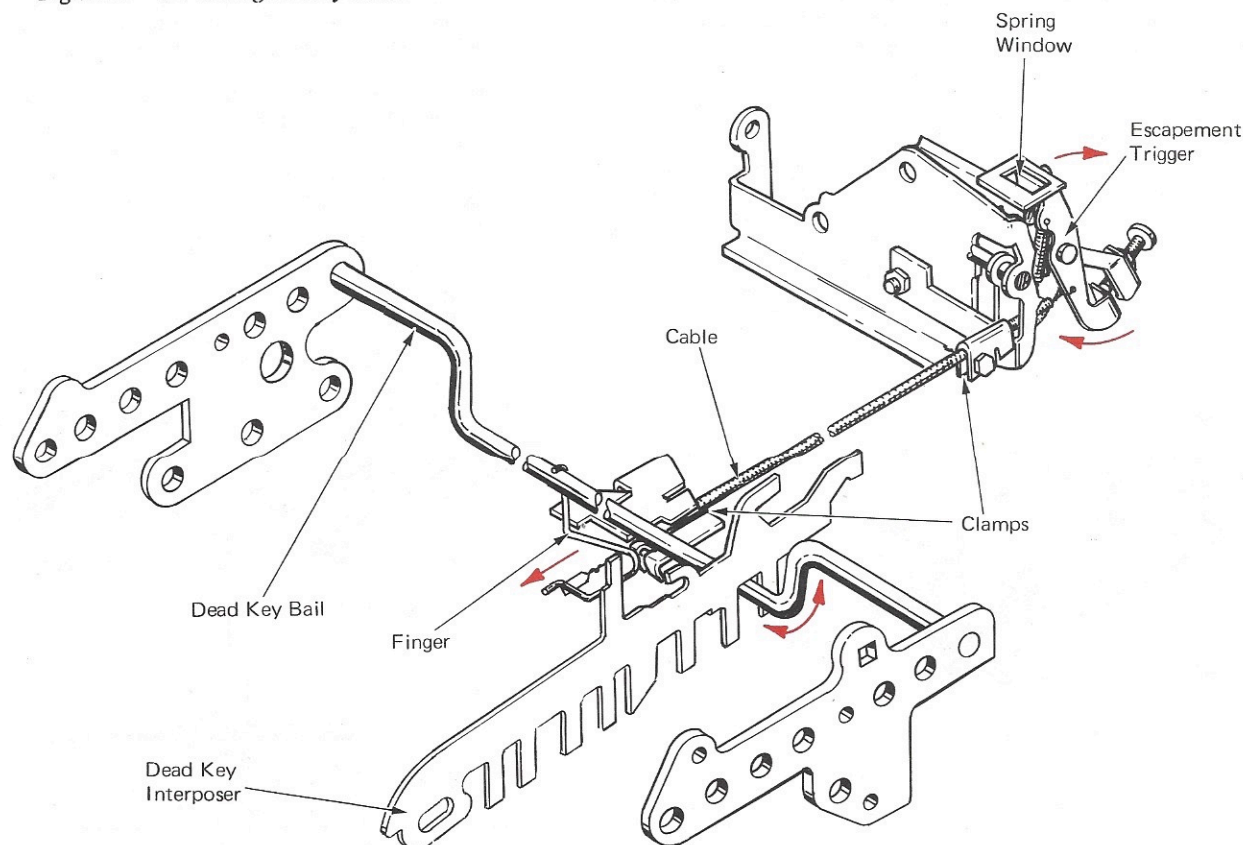


Figure 2 - Dead Key Mechanism

DOUBLE INDEXING DEVICE OPERATIONAL THEORY

The purpose of the double indexing device is to provide a second index operation for each carrier return operation.

Double indexing is accomplished in the following manner. When the carrier return button is depressed, a normal indexing and carrier return operation occurs. Motion from the carrier return shoe bellcrank through the interlock shaft rotates the index trip shaft. The tripper, mounted on the trip shaft, rotates downward, pulling the index keylever pawl down. The index keylever pawl trips the index interposer, causing a second index operation.

The double indexing mechanism can be locked out for normal linespacing. To lock out the double indexing operation, the mode switch, mounted above the on-off switch lever, is rotated toward the front of the machine. The mode lever, through a link and locator, loads the tripper and tripper shaft to the left so the tripper rotates between the index and carrier return keylever pawls when operated. When the tripper rotates between the index and carrier keylever pawls, normal linespacing will occur.

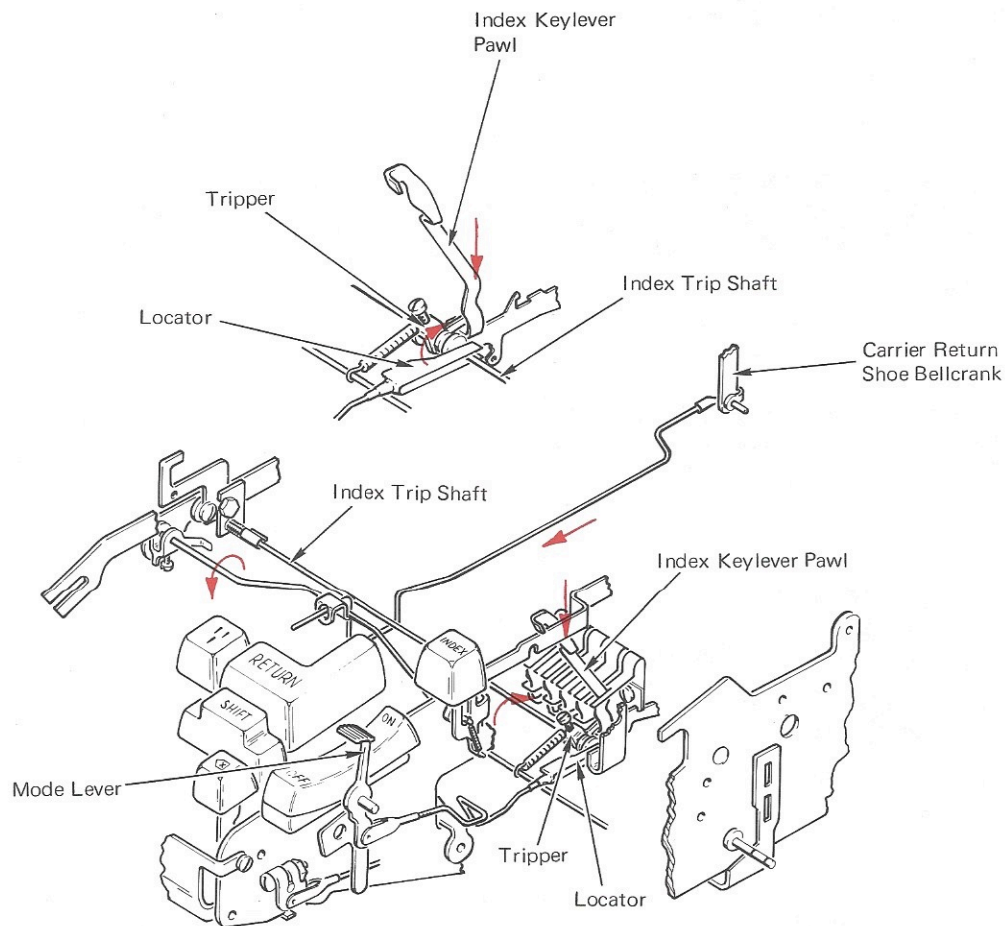


Figure 1 – Double Indexing Device

EXTERNAL RIBBON CONTROL OPERATIONAL THEORY

The external ribbon control is designed for customers with applications that require frequent changes of a bicolored ribbon by allowing the operator to select stencil, black or red ribbon positions without lifting the cover.

The control lever is located on the left side of the carrier. The operation and appearance is similar to the impression selector lever (Figure 1).

The ribbon control lever is mounted with the ribbon control bellcrank inside the left-hand carrier casting. A wire

link connects the control lever and the control bellcrank. When the control lever is moved front-to-rear, the control bellcrank pivots on its mounting stud. The control bellcrank causes the lift control lever to pivot. Connected to the lift control lever is the lift control link. The lift control link for the external ribbon control functions the same as the lift control link on the standard fabric ribbon mechanism.

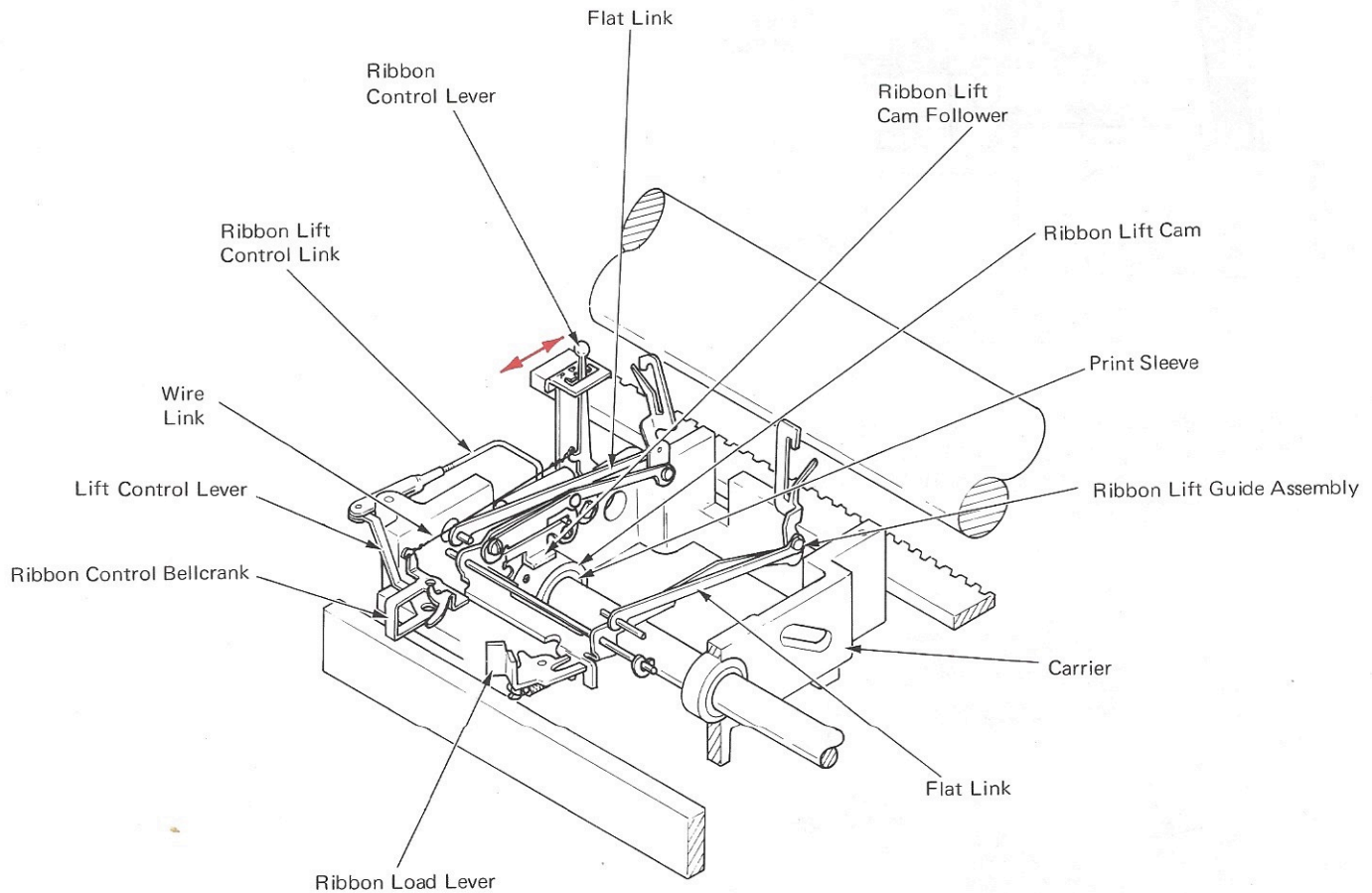


Figure 1 – External Ribbon Control Mechanism

The manual velocity control provides the operator with a means of controlling the automatic velocity control feature. A control wheel mounted just to the right of the on-off keybutton determines keyboard velocity. When the control wheel is in the middle or normal position, the keyboard is in the automatic velocity control mode. With the control

wheel rotated away from the operator, all keyboard positions will be low velocity. The control wheel must be held in this position. When the control wheel is rotated toward the operator, the keyboard will be in high velocity. This position is detented and need not be held (Figure 1).

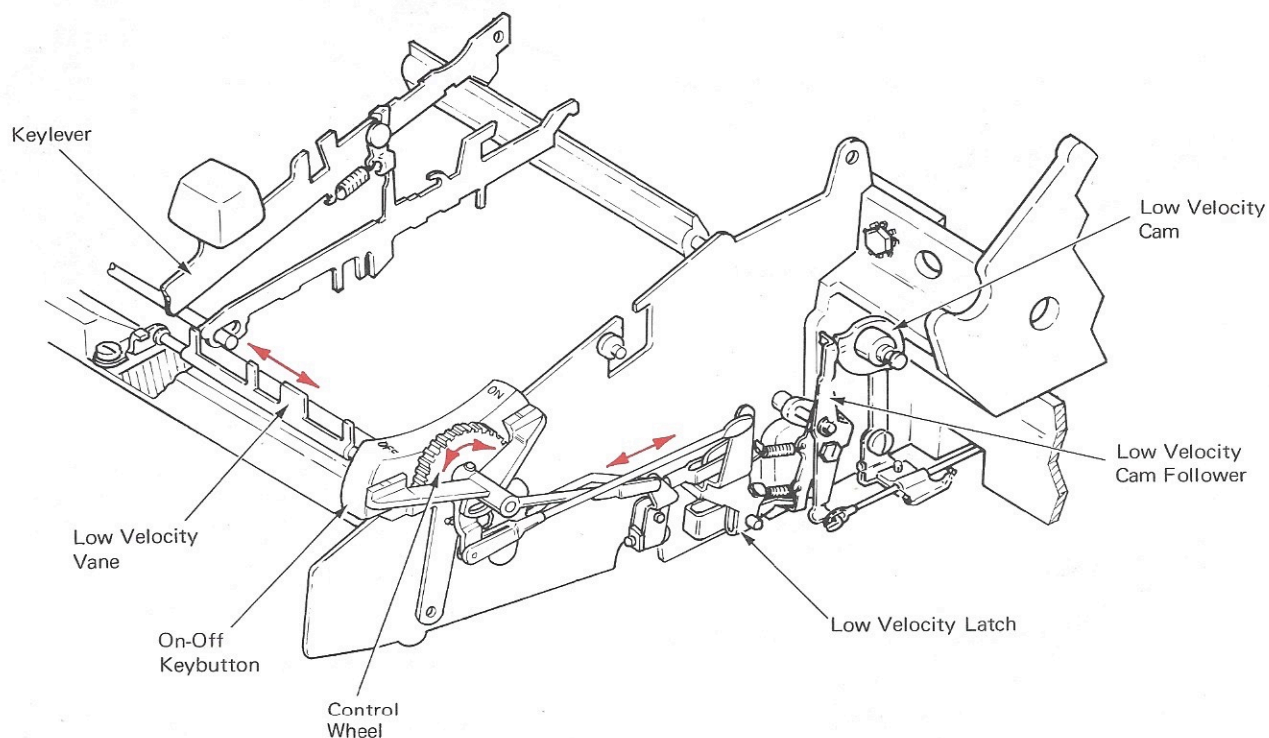


Figure 1 – Manual Velocity Control

PIN FEED PLATEN OPERATIONAL THEORY

The purpose of the pin feed platen is to feed continuous forms (Figure 1). This is accomplished by pin wheel assemblies, on each end of the platen which engage perforations along the outside edges of the form. Platen cores come in lengths to accommodate most standard width forms.

During operation, the feed roll release lever should be forward in the released position because the feed rolls are not required to feed the paper.

The platen core is keyed to the right hand pin wheel body. The pin wheel body is setscrewed to a hexagon shaped platen shaft and rotates with the shaft whenever the platen is indexed. Each pin wheel body contains 9 pins symmetrically spaced around its surface. A cam mounts over the hub of the pin wheel and fits into a guide slot in each pin. Mounted onto the cam is a control plate which prevents the cam from rotating. The cam control plate is prevented from rotating by an anchor rod. The anchor rod extends the width of the platen and is mounted to each side of the center cover.

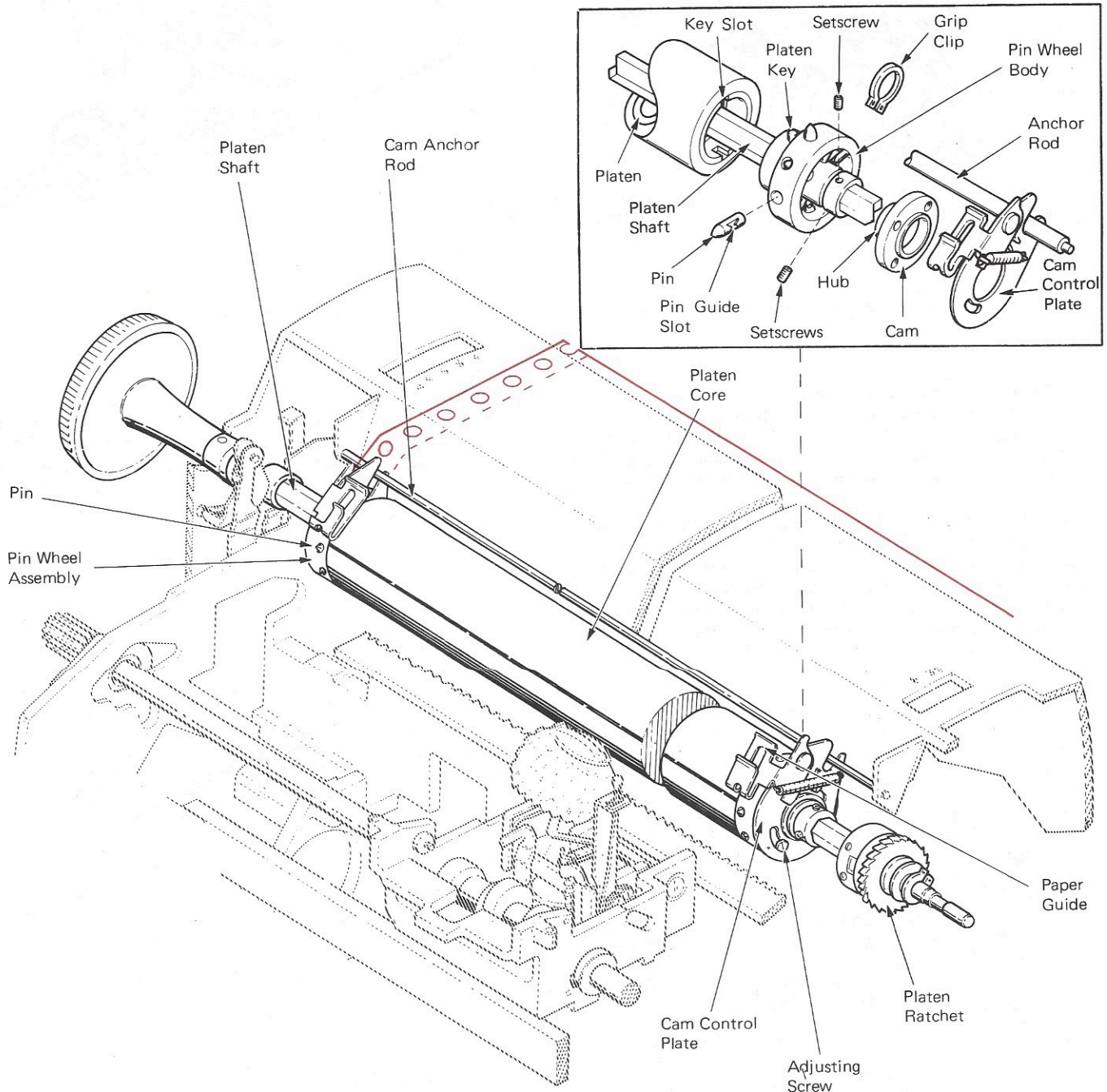
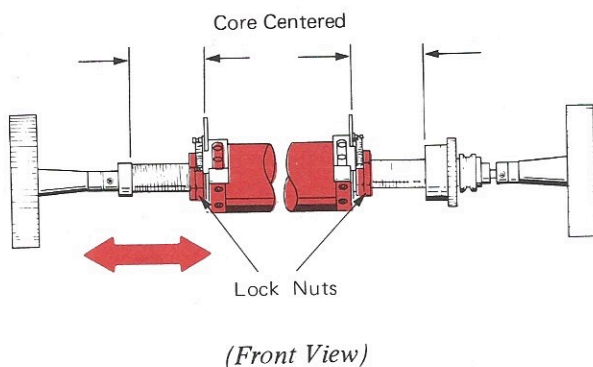


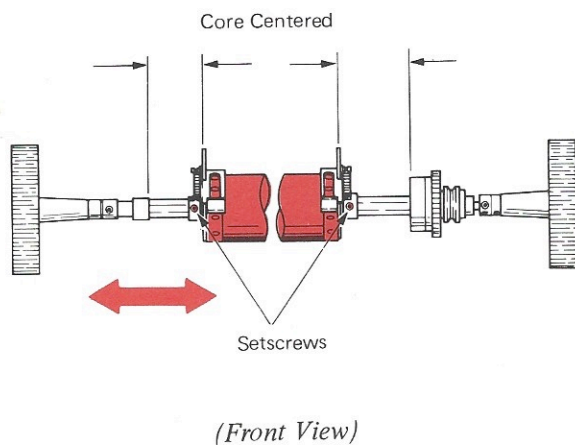
Figure 1 – Pin Feed Platen Assembly

PIN FEED PLATEN ADJUSTMENTS

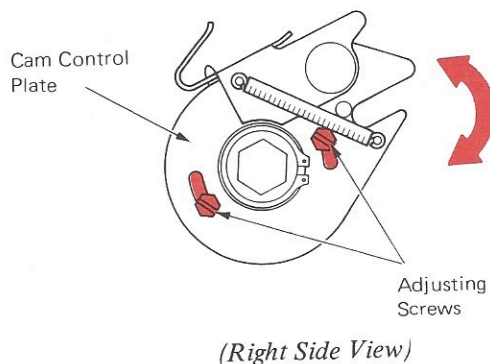
1. **Platen Core Lateral Position (Level 1)** – Loosen the locknuts on both ends of the platen and center the core. Turn locknuts in and tighten.



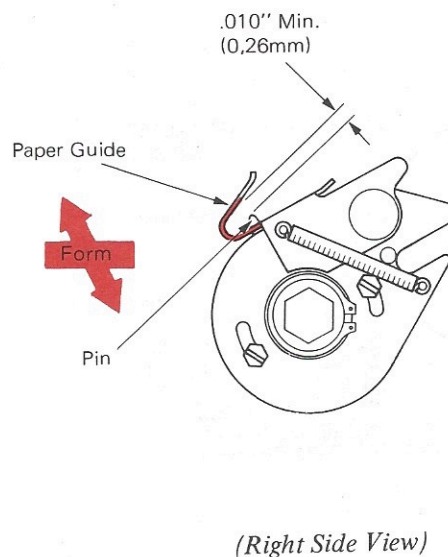
Level 2 – Loosen the setscrews in the pin wheel bodies. Center the core and slide the pin wheel assemblies up against each end. Tighten the setscrews.



2. **Pin Wheel Assembly** – Adjust the cam on the control plate so the pins are fully extended immediately after passing into the slot of the form guide.

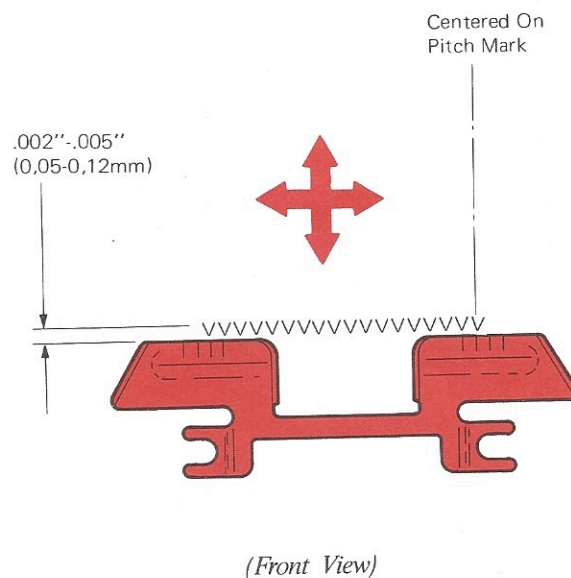


3. **Paper Guide** – Form the front extension on the paper guides front-to-rear for a minimum of .010" clearance between the underside of the guide and a fully extended pin as it passes under the guide.



CARDHOLDER – Adjust the cardholder for the following conditions:

- a. Position the cardholder up or down so the bottom of a row of typed Vs is .002"-.005" above the top edge of the cardholder.
- b. Position the cardholder left or right so the bottom of a typed V is centered on the pitch mark on the cardholder.



The purpose of the shift sensing mechanism is to move the low velocity vane to the left when the machine is in the upper case mode. This allows certain predetermined keyboard positions that are low velocity in lower case, to be high velocity in upper case. This is used on keyboards with the ten key numeric inset such as the 056 and 065 OCR keyboards where the numerals 8 and 9 are above the comma and period (Figure 1).

With the machine in lower case, the low velocity vane is held to the right by a flat spring. The vane actuating bell-

crank is mounted to the rear of the vane and held against its spring tension in a counterclockwise position by the shift sensing cable. The other end of the cable is mounted to a plate on the rear of the shift arm. When the machine is shifted to upper case, tension on the sensing cable is relaxed and the bellcrank spring rotates the bellcrank clockwise. As the bellcrank rotates, it pushes the low velocity vane to the left. This allows certain interposers which have low velocity in lower case to now have high velocity in upper case because the lugs on the low velocity vane are not in front of the interposers.

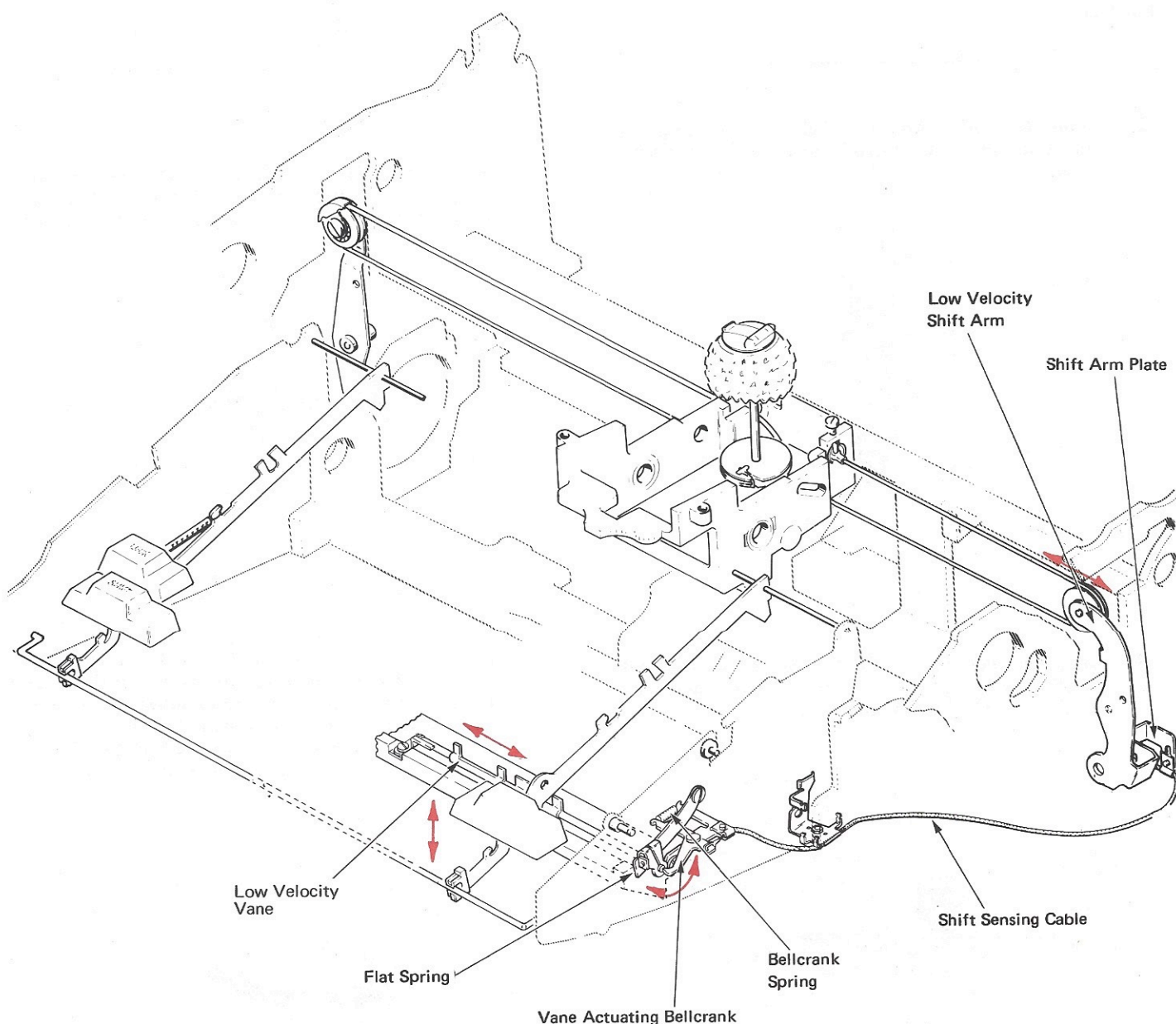


Figure 1 – Shift Sensing Mechanism

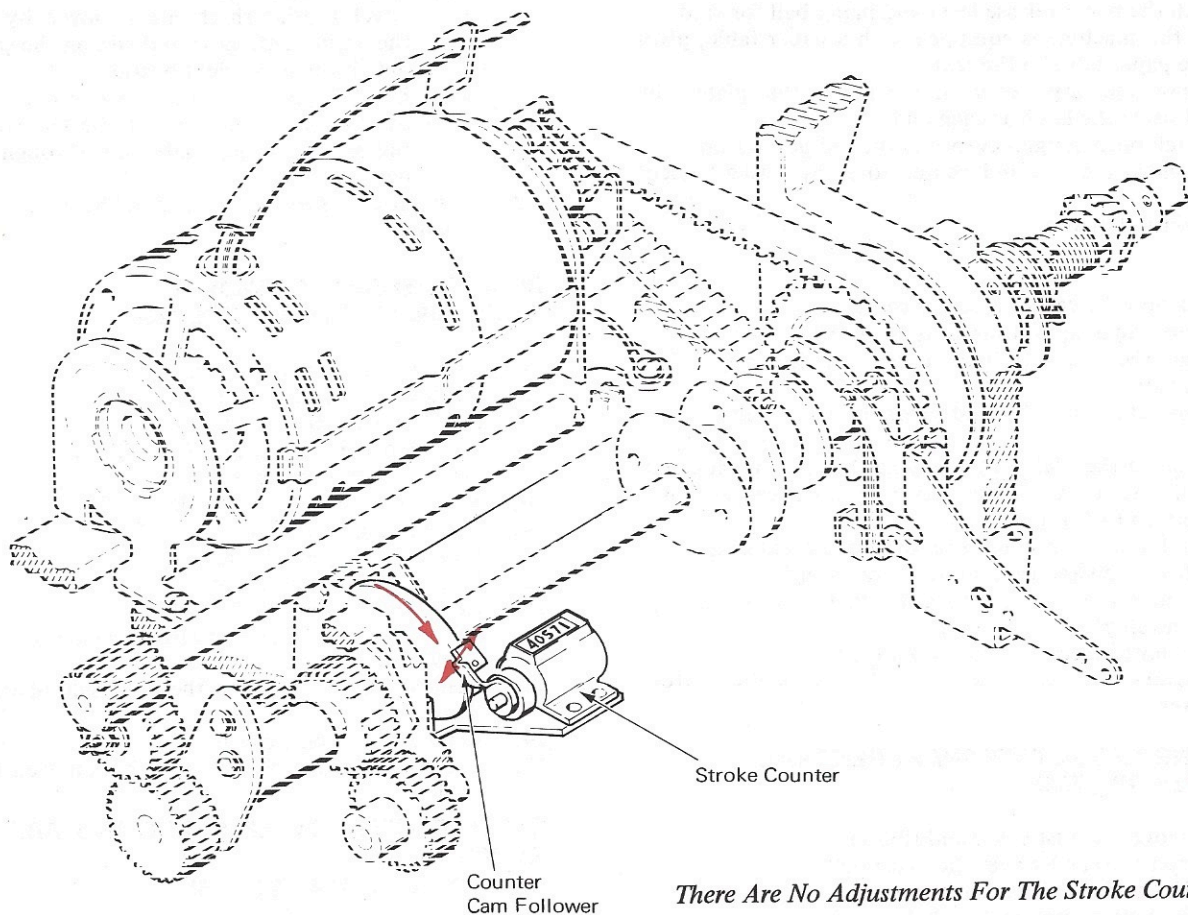
STROKE COUNTER OPERATIONAL THEORY

The purpose of the stroke counter is to record actual usage of the "Selectric," "Selectric" II and Correcting "Selectric" typewriters. This is accomplished by a nonresetting mechanical counter mounted inside the power frame above the left-hand cam of the cycle shaft assembly (Figure 1).

The stroke counter arm is spring loaded against the cam and moves up and down with the camming surface each time

the cycle shaft operates. The left-hand dust shield has a portion removed to allow the counter to be read.

Stroke counters for the "Selectric," "Selectric" II and Correcting "Selectric" Typewriters are available with a 10:1, 100:1 or 240:1 ratio. This means that for every 100 print operations, the 100:1 ratio counter will advance 1, etc.



There Are No Adjustments For The Stroke Counter.

Figure 1 – Stroke Counter

9. On machines without an adjustable collar, check to see the shims remain in place. Check to see that proper end play (.001"-.006") is present. Reshim if necessary.
10. The drive belt or cycle clutch can now be removed.
11. The following adjustments should be checked after the cycle shaft is replaced:
 - a. Idler gears
 - b. Cycle shaft end play
 - c. Cycle clutch spring
 - d. Cycle clutch latch bite
 - e. Damper spring (if used)
 - f. Filter shaft timing
 - g. Print shaft timing

ROTATE SELECTION DIFFERENTIAL REMOVAL (Mech. Code 702, 704, 711, 721, 723)

1. Position the carrier to the extreme right.
2. Remove the left dust cover, platen, feed rolls and paper deflector.
3. Remove the machine from the bottom pan.
4. Disconnect the clevises and remove them from the selector latch links.
5. Remove the latch bail spring.
6. Remove the motor.
7. Remove the rotate latch springs.
8. Pull out the rotate links.
9. Disconnect the tilt differential spring.
10. Remove the upper guide bracket screws.
11. Remove the balance arm mounting stud.
12. Disconnect the minus 5 bail drive link from the right end of the balance arm.
13. Rotate the cycle shaft until the cam followers are on the low points of the cams.
14. Remove the rotate differential assembly.
15. The following adjustments should be checked after the rotate selection differential assembly is replaced:
 - a. Typehead homing
 - b. Rotate latch clearance
 - c. Rotate differential guides
 - d. Selector latch links

KEYBOARD INTERPOSER REMOVAL (Mech. Code 702, 709, 717, 721)

1. Align the carrier over the linelock interposer.
2. Disconnect the operational keylever springs and repeat bail spring.
3. Remove the keylever upstop.
4. Remove the spacebar equalizing rod.
5. Remove the bell bail lever.
6. Remove the bellringer bail.
7. Remove the margin rack.
8. Slip sound deadening over operational keybuttons and pivot the keyboard up and out of the way.
9. Push the fulcrum rod to the interposer being removed with a fulcrum rod tool.
10. Remove the spring from the interposer being removed.

SHIFT CAM REMOVAL (Mech. Code 702, 716, 723)

1. Turn the typehead counterclockwise and remove the relaxed rotate tape from the shift arm pulley.
NOTE: On one-piece shift arm the rotate tape must be disconnected from the right side of the carrier.

2. Remove the shift interlock spring, the shift release arm spring and the shift detent spring.
3. Remove the C-clip from the operational shaft and remove the shift clutch ratchet.

7X1

4. Remove the interlock.
5. Remove the detent arm.
6. Disconnect the shift release link.
7. Remove the shift release arm.

7X3-7X5

4. Disconnect the shift release link.
5. Remove the shift support bracket screw.
6. Remove the shift support bracket, interlock and shift release lever as an assembly.
7. Remove the detent arm.

All

8. Remove the shift clutch spring (behind the ratchet).
NOTE: Observe the spring position for replacement.
9. Remove the shift clutch arbor.
10. Remove the shift cam.

ROTATE SPRING REPLACEMENT (Mech. Code 702, 704)

Gear Tilt

1. Remove the left dust cover.
2. Remove the ribbon.
3. Center the carrier over the cycle shaft.
4. Gradually remove the tension from the rotate spring. Remove the two nuts, one on newer machine, immediately to the right of the yoke on the carrier, remove the black rotate spring tension clip from under the nut.
5.
 - a. On older machines, back out the two screws on the right 1/4" and remove the screw on the left, which is under the cycle shaft.
 - b. On new machines, remove the lower right and left screws and back out the upper right screw 1/4".
6. Remove the striker and rotate spring retaining plate. The rotate spring can now be removed.
NOTE: In new machines there may be a spring clip (P/N 1141238) that prevents the spring from being trapped in the pulley notch. If not, one should be added on reassembly.
7. The following adjustments should be checked after the rotate spring is replaced:
 - a. Rotate spring tension
 - b. Typehead homing
 - c. Damper spring (if used)

Gearless Tilt

1. Remove the left dust shield.
2. Center the carrier over the cycle shaft.
3. Remove the tension from the rotate spring gradually.
4. Remove the screws from the rotate spring retaining plate.
5. Remove the rotate spring retaining plate. The rotate spring may now be removed.
6. The following adjustments should be checked after the rotate spring is replaced:
 - a. Rotate spring tension
 - b. Typehead homing
 - c. Damper spring (if used)

CORD REPLACEMENT

1. Perform cover removal.
2. Remove dust shields.
3. Remove both cords and hand cycle the machine until the mainspring tension is relaxed.
4. Disconnect the carrier return unlatching link.
5. Manually latch the carrier return mechanism and rotate the turning wheel, while counting escapement shaft revolutions, until the mainspring is wound the proper number of turns (Figure 3).
6. With the carrier to the right, connect the cord to the carrier return cord drum, position cord to the left over the idler pulley, around the left rear corner pulley and connect to the carrier using scissor clamps or the pusher end of a springhook (Figure 1).
7. Hold the slack out of the carrier return cord and rotate the turning wheel until the carrier approaches the left side frame. Stop hand cycling when the notch in the escapement cord drum is visible.
8. Connect the escapement cord to the escapement cord drum and wrap approximately 1 turn of the cord around the drum (Figure 2).
9. Thread the cord around the cord tension pulley and connect it to the carrier.
10. Pull the carrier return cord over the left front corner pulley and connect the carrier return unlatching link.

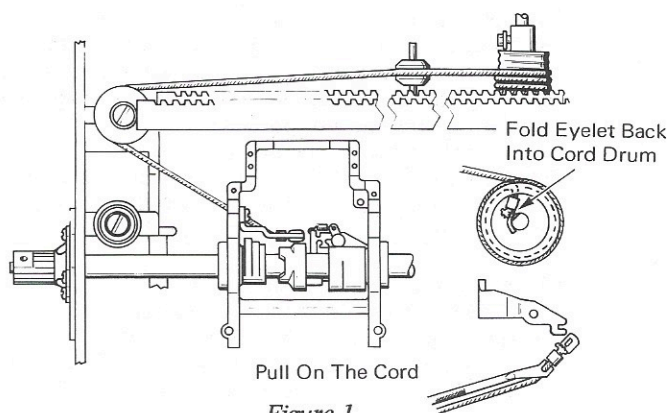


Figure 1

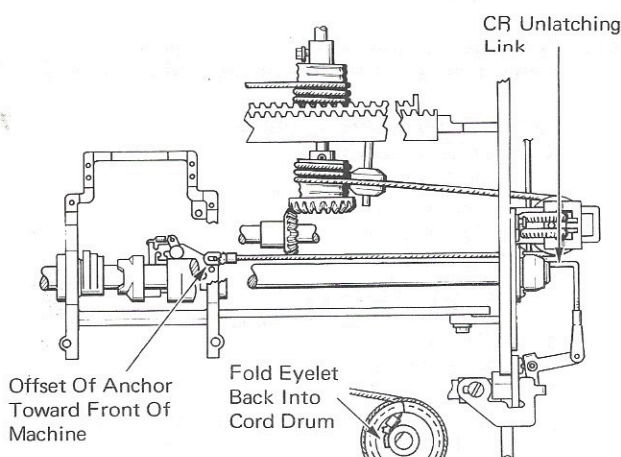


Figure 2

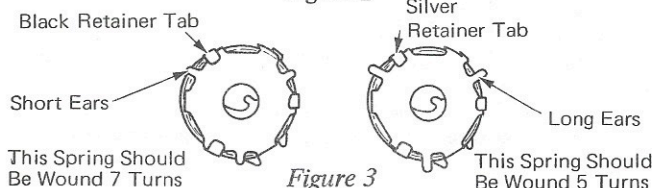


Figure 3

"A FRAME" PAPER FEED REMOVAL (Mech. Code 722)

The feed rolls may be removed from the "A frame" in the following manner:

Carefully spread the feed roll arm assembly and remove the front feed roll. Pivot the rear feed roll toward the front and remove.

The "A frame" is removed in the following manner:

1. ("Selectric" II and Correcting "Selectric" Typewriters) Remove detent release lever and stud.
 2. Remove the platen ratchet detent.
 3. Remove the index link from the index pawl without disturbing its adjustment.
 4. Remove index pawl overthrow stop.
 5. (Dual Pitch) Disconnect half backspace links, loosen half backspace stop bracket nut and pivot bracket from under nut.
 6. (Dual Pitch) Remove pitch cam cable from switch pitch sector gear.
 7. Scribe the position of the multiple copy control detent plate; loosen the screw and pivot the plate from under the screw.
 8. Disconnect both anchor springs. These springs connect the paper feed assembly to the power frame.
 9. Lift the paper feed assembly at the rear; pull toward the rear of the machine and remove the assembly.
- NOTE: Removing the "A frame" assembly will allow easy access to rotary backspace, escapement bracket and transport cords.

REMOVAL OF 27 TOOTH RATCHET ASSEMBLY (Mech. Code 720)

1. Remove feed roll release lever.
2. Remove selector lever. Move grip clip to left until clip disengages from selector lever.
3. Remove selector lever mounting stud. Retain stud, clip and spacer. These will be used later.
4. Remove pawl assembly.
5. Remove detent release lever.
6. Remove detent release lever mounting stud.
7. Disconnect tilt spring. Remove right tilt pulley bracket and keeper.
8. Remove detent.

INSTALLATION OF 54 TOOTH RATCHET ASSEMBLY (Mech. Code 720)

1. Install grip clip, index bracket and spacer onto index selector lever mounting stud.
2. Install selector cam onto index selector lever using stud and C-clip.
3. Install stud with nut and washer onto index bracket.
4. Install selector lever.
5. Install spring onto stud and engage selector cam and secure with C-clip.
6. Remove detent roller from old style detent assembly and install on new detent.
7. Install detent assembly using stud that was in machine and detent release lever mounting stud.
8. Install C-clip that was on stud.
9. Install tilt pulley bracket and keeper. Connect tilt spring.
10. Install detent release lever.
11. Install pawl assembly.
12. Install feed roll release lever.

- q. Carbon ribbon drive spring and bearing
- r. Power frame center bearing
- s. Platen bushings
- t. All other rotating or pivoting members at the bearing area which are not specifically excepted in the listing following

Use IBM No. 23 grease on the following:

- a. Operation ratchets
- b. Keylever return springs
- c. Interposer latch springs
- d. Ribbon lift control lever
- e. Linelock bracket
- f. Filter shaft flutes
- g. Operational keylever pawl guide studs
- h. Tape guide
- i. All cams on print sleeve
- j. Ball joint
- k. Cycle clutch and shift clutch springs
- l. Feed roll bearing
- m. Cycle clutch restoring cam
- n. Low velocity latch contacts
- o. All sliding parts not excepted

